SIEMENS

SIMATIC

Process Control System PCS 7
SIMATIC Route Control

Manual

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Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring to property damage only have no safety alert symbol. The notices shown below are graded according to the degree of danger.

Danger
indicates that death or severe personal injury **will** result if proper precautions are not taken.

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indicates that death or severe personal injury **may** result if proper precautions are not taken.

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with a safety alert symbol indicates that minor personal injury can result if proper precautions are not taken.

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without a safety alert symbol indicates that property damage can result if proper precautions are not taken.

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indicates that an unintended result or situation can occur if the corresponding notice is not taken into account.

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The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel.** Within the context of the safety notices in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

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Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Preface

Purpose of This Manual

This manual provides a comprehensive overview of programming with SIMATIC ROUTE CONTROL. It will help you install and commission this software. Procedures for program creation, user program setup, and the language elements are presented.

This manual is intended for programmers and persons involved in project planning, commissioning, and servicing of automation systems.

We recommend that you familiarize yourself with the examples in Chapter 6 "Guide to Project Planning. "This will help you get started with programming of SIMATIC ROUTE CONTROL.

Basic Knowledge Required

Basic knowledge of automation engineering is required to understand this manual.

In addition, knowledge of how to use computers or PC-like equipment (such as programming devices) in the Windows 95/98/2000 or NT/XP operating systems is assumed. Because SIMATIC ROUTE CONTROL is based on the STEP 7 / PCS 7 basic software, you should also know how to work with this basic software. For this information, consult the manual entitled "Programming with STEP 7 / PCS 7."

Scope of This Manual

This manual is valid for the SIMATIC ROUTE CONTROL V6.1 software package.

Changes from the Previous Version

As compared to the previous version, this documentation also contains the following enhancements for ROUTE CONTROL V6.1:

- Maintenance safety
- Operating systems
- SIMATIC S7 417-H
- HW Configuration

Further Support

If you have any technical questions, please get in touch with your Siemens representative or agent responsible.

You will find your contact person at:

http://www.siemens.com/automation/partner

You will find a guide to the technical documentation offered for the individual SIMATIC Products and Systems here at:

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The online catalog and order system is found under:

http://www.mall.ad.siemens.com/

Training Centers

Siemens offers a number of training courses to familiarize you with the Process Control System PCS 7. Please contact your regional training center or our central training center in D 90327 Nuremberg, Germany for details:

Telephone: +49 (911) 895-3200.

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- A forum, where users and experts from all over the world exchange their experiences.
- Your local representative for Automation & Drives.
- Information on field service, repairs, spare parts and more under "Services".

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1 What's New

1.1 Welcome

Welcome to SIMATIC Route Control.

1.2 What's New in SIMATIC Route Control V6.0?

In this section, you will find information about the new and expanded functions of SIMATIC Route Control V6.0 as compared to the previous versions:

- Route Control V5 based on BRAUMAT V5
- Route Control V5 based on PCS 7 V5

General

- **Windows 2000 Capability**

  Like PCS 7, SIMATIC Route Control V6.0 can run on the Windows 2000 operating system.

- **Integration in PCS 7**

User Interfaces

A major component of the Route Control V6.0 product is its integration in the PCS 7 environment. In many areas, the user interfaces (dialogs, icons, etc.) have been revised, simpler procedures for working with the tools have been introduced, and a wizard and WinCC faceplate have been added. The Route Control Wizard also includes a plausibility check of the configured element and route blocks to detect errors early and ensure data consistency between the project and the Route Control project.

AS-OS Connection (Route Control AS and Server)

Connection between the automation systems and the Route Control server is carried out by means of BSEND services (in V5, this was accomplished using alarm services).

Messages

Blocks in the Route Control library now use standard alarm services (ALARM blocks) and communication routes to a WinCC message server. (In V5, messages could only be sent via the Route Control server, and there were no Route Control AS messages sent directly to WinCC.)

To avoid dependence on BRAUMAT / SISTAR library blocks (V5), the required blocks have been integrated in the Route Control library.

Elimination of Major Sources of Error

In Route Control V6.0, the data areas in the automation systems have been separated and revised, thus eliminating the problem of extended data blocks that occurred in V5. As a result, route data (now located in the instance data block of RC_IF_ROUTE, see below) are separated from the actual element list (still DB101 to DB400).

To reduce the burden on the OB1 cycle, route blocks can now also be called in other organization blocks.

- **Basic Package - Incremental Expansion of Number of Material Transports**

  The basic package for SIMATIC Route Control V6.0 supports material transports, from project engineering to the runtime system, to operator control and monitoring of routes and route elements, including process messages.

  The basic package has a limit of 30 routes (= 30 simultaneous material transports, maximum). An upgrade package provides an incremental expansion to 100 or 300 material transports.

- **Option Packages**

  The functionality of SIMATIC Route Control V6.0 cannot yet be expanded in Phase 1 (V6.0) by adding option packages to the basic package. Option packages (H-Option and S7-317) will not be available until Route Control V6.1. For additional information, see the *Readme file for SIMATIC Route Control V6.0*.

- Redundancy

  Route Control provides the option of a redundant configuration for the Route Control server that processes route requests, thus ensuring permanent availability (see "Fault-Tolerant Route Control").

- **Integration in PCS 7 OS**

  Route Control V6.0 provides improved integration in the PCS 7 OS (client) with a faceplate, a WinCC faceplate, and a cross-selection between WinCC pictures and the Route Control Center (displaying information about a route).

Project Engineering in the Engineering System

Several important additions have been made for project engineering of the routing system, making it easier to enter and import existing data from an S7 project in a Route Control project.

A portion of the project engineering takes place in SIMATIC Manager and associated applications:

- CFC: project engineering of routes
- CFC: project engineering of elements
- CFC: configuration of a Route Control automation system
- NetPro: project engineering of AS-AS connections
- NetPro: project engineering of AS-OS connections

The Route Control Wizard provides assistance to facilitate all of these aspects of project engineering.

- **Route Control Server and Route Control Clients**

  Because Phase 1 does not yet have its own Route Control object manager (OM) in SIMATIC Manager, settings for the Route Control server are made in the Route Control Wizard, imported in the Route Control project engineering, and then loaded from the RC project engineering onto the server computers.

- **S7 Standalone and Multiprojects**

  SIMATIC Route Control V6.0 supports both S7 standalone and S7 multiprojects of SIMATIC Manager. Each standalone or multiproject can have no more than one Route Control project. If various systems are implemented using multiple multiprojects, then several Route Control projects must also be used. The maximum scope of a Route Control project is the multiproject.

- **Type-Based Engineering (Sample SFC for Route Control)**

  Route Control provides a sample SFC (SFC Typical) for the routing system, which includes S88 status tabs with sample programming. This SFC can be copied by the user and modified as required. The SFC provides status based on S88. The following steps are preconfigured:

  - Transfer relevant parameters (source and destination locations, function ID, material, etc.)
  - Request a route
  - Control a route (mode levels)
  - Deactivate a route

- **Interface to Processing Programs**

  The interface between SIMATIC Route Control V6.0 and the actual processing in the automation system consists of:

  - SFC types created using SFC standard tools in PCS 7 V6.0 and higher
  - Route Control interface blocks for:
  - Elements and routes
  - AS-AS cross-coupling within a Route Control project
  - AS-AS cross-coupling beyond several Route Control projects
  - Diagnostics
  - Use of the preconfigured sample SFC

- **Plant Hierarchy in the Plant View**

  The plant hierarchy in SIMATIC Manager allows you to display your project with an appropriate structure. The plant view of the Route Control engineering system can include up to two levels of the plant hierarchy (process cell and unit) in accordance with S88.01. These two levels are recognized by the BATCH attributes in the hierarchy container.

  To improve the structure, (bi-level) neutral containers can also be added to the plant hierarchy in Route Control.

- **Fault-Tolerant Route Control**

  Route Control servers can have a redundant configuration to increase availability (fault tolerance) and enable software updates during operation. A master/standby failover takes place between the two Route Control servers if redundant operation is required.

  Redundancy is achieved with two Route Control servers in a redundant configuration, whereby the servers do not require local data storage. To enable the Route Control client applications (Route Control Center) to access the current database of the Route Control server, the two local databases are synchronized with respect to the project engineering. If one Route Control server fails, the other server again reads in the project engineering database and initiates a general request. This general request provides the new master server with the current status of the elements and routes in the automation systems. This strategy prevents the need for continuous synchronization of the server data and persistent data on a hard disk. Data must only be synchronized when a Route Control server is initially loaded from the Route Control project engineering application (see "Loading the Server"). However, this process is transparent to the user.

- **Route Control Interface Blocks**

  SIMATIC Route Control V6.0 takes advantage of the new functionality of SFC types in the engineering system. Alternatively, SIMATIC Route Control V6.0 still provides special interface blocks with a new technical design as communication interfaces to the processing programs in the automation system:

- **Faceplates**

  A Route Control block icon and control dialog (faceplate) for the RC_IF_ROUTE block is available for operation on the PCS 7 OS.

- **RC_IF_ROUTE**

  This is the central block for route activation (previously: ROUTE_CM block).

- **RC_IF_CFG**

  This block is used centrally one time for each automation system. Parameters for the automation system number and the communication ID for the cross-coupling configuration are assigned in this block. The IDs can be assigned by the Route Control Wizard. This makes it easier for you to configure the cross-coupling entries.

- **Route Control Wizard**

  A wizard in the context of SIMATIC Manager helps the user configure the cross-coupling communication (communication ID). The wizard can also be used to export the portion of configured data relevant for Route Control and import it in the Route Control project engineering:

  - Plant hierarchy
  - Automation systems
  - AS-AS and AS-OS connection information
  - Elements
  - Route properties (route ID and fixed/dynamic specification)

  Additionally, the Route Control Wizard is used to specify the relevant message server (WinCC message OS) for Route Control and to check the element and route IDs for consistency and plausibility.

Route Control Runtime System

- **Working in the WinCC Faceplate**

  The actual faceplate can be opened by means of a block icon that displays the most important statuses of a route. This block icon shows the status of the route in various views, enables operator control of the route, and displays the messages currently pending for the route.

  The Route Control operator prompts are displayed in the group display of PCS 7 OS.

- **Working in the Route Control Center (RCC)**

  The RCC provides a highly detailed display of the route, route status, elements and element status, and enables control operations beyond the scope of the Route Control WinCC faceplate.

- **Authorization Management**

  SIMATIC Route Control V6.0 supports the *SIMATIC Logon* central user management of PCS 7. In Phase 1 (V6.0), five user groups with specific names must be created in Windows. Due to a redesign of the *SIMATIC Logon component* itself, Route Control will be integrated and administered in the *Logon Admintool* starting with Route Control V6.1. From a current perspective, it will then be possible to freely select the names of the user groups.

Miscellaneous Changes

- **On and Off Delay Times for Elements**

  Starting with Route Control Version 6, the On and Off delay times for elements relate to the mode level and will be valid across automation systems. These times are absolute and are no longer relative to the preceding element, as was the case in Version 5.

  When project engineering data are migrated from Version 5 to Version 6, the conversion tool automatically converts the element times. However, because these times are now absolute, the maximum time has been limited to 255 seconds.

- **Element Sorting**

  The sort number for elements in a partial route has been eliminated from the engineering tool because it was irrelevant with respect to the order in which elements are switched on or off. Because Route Control V6.0 is currently designed for transport of liquids only (and materials that can be transported according to this concept), the sort number has been removed. This sort number will become relevant when solid material variants are introduced because interlocking of elements is dependent on the element sequence for these materials.

1.3 What's New in SIMATIC Route Control V6.0 SP1 ?

Route Control V6.0 Service Pack 1 has the following new functions:

- **External material interface**

It is now possible to apply material master data from an external source to the Route Control server. In addition to the actual materials, the successor relationships can also be defined.

Material Interface

- **Route Log**

The following information is recorded in the route log:

- Operator input by means of the Route Control Center
- Status of a route (Start, Stop, Pause, etc., mode activation/deactivation).
- Startup, operation, and shutdown of the Route Control server

These route logs can be displayed and saved using an application that is provided with SIMOTION Route Control. This route log interface offers a wide range of functions for filtering, searching, and evaluating logs.

Route Log

- **User-defined element blocks**

In addition to the preset element types (control, parameter, linking, and sensor elements), users can also define their own element types (CFC), apply them in the Route Control project engineering, and interconnect them in partial routes.

Example for User-Defined Type

Note

You can access all changes relating to Route Control V6.0 SP1 in this online Help system by searching for "SP1".

1.4 What's New in SIMATIC Route Control V6.1?

Integration in the PCS 7 System Setup

Beginning with SIMATIC Route Control V6.1, this product is available to you from within the system setup for PCS 7. Similar to other add-on packages, you can select which product you wish to install at the beginning of the system setup and the system setup will perform the installation automatically without further prompting, see also Installing Route Control Components

Automation License Manager (ALM)

As of version V6.1, SIMATIC Route Control supports the Automation License Manager. The license model of Route Control has thereby been enhanced – see also Authorization (Overview)

Route Control Maintenance Safety

Route Control V6.1 provides support to servicing personnel by enabling them to set the automation system to "Maintenance" status. New material transports are then prevented through this automation system - RC Support for Maintenance Work

Operating Systems

SIMATIC Route Control can now run under Windows XP Professional (RC Center, RC Engineering) or Windows 2003 Server (RC Server) in addition to Windows 2000, see also Hardware and Software

SIMATIC S7 417-H

Route Control V6.1 now also supports SIMATIC S7 H-CPUs. In addition to the server level, the automation systems can now also be designed and implemented with fault-tolerance. The Route Control library has been adapted correspondingly so that both non-H and H-machines are supported. A combination of devices is also possible. This means a route can be controlled by both H-machines and non-H machines. See also Communication with H-Machines

HW Configuration

You can now use the HW Config application to configure the Route Control server and get support from the Route Control Wizards when generating the named communication connections. These connections are also downloaded to the PC station on the target computer similar to other WinCC or BATCH servers - the connections are then established by the Route Control server via these configured connections, see Hardware Configuration (HW Config)

CPU Firmware

SIMATIC Route Control now also supports CPUs with firmware versions before V3.1.0. The Route Control Wizard no longer stops with an error message; it only shows a warning. We still recommend that you use firmware V3.1.0 or later.

SIMATIC logon

SIMATIC Route Control V6.1 is now based on the same version of SIMATIC Logon as all other PCS7 V6.1 products. The authorization policy has not changed in comparison to RC V6.0 or V6.0 SP1. See User Roles for Route Control.

Multiprocessor Computers

SIMATIC Route Control can not run on computers with more than one processor.

Security

With SIMATIC Route Control, the share attribute for directories is no longer available for "everyone". It can only be used by Route Control groups (RC_ENGINEER, RC_MAINTENANCE, RC_OPERATOR_L1 .. L3). This means that only users belonging to one of these groups can access the shared directories from another computer.

Material in the RC Center

Material can not be changed even during an active route (manual mode) in the Route Control Center. Before RC V6.0 SP1, it was only possible to change the material when the route was not active. See Route Control Center: Route Properties.

Route Control messages

In the WinCC alarm server for Route Control messages, Route Control wizards no longer generate messages based on the route instance for all configured routes; they only generate messages in general form.

Example: the message "Faulty route %d" is generated instead of "Faulty route 23". The wildcard (%d) is assigned the number of the corresponding route during runtime and generates a message.

This means message definitions in a WinCC project (OS) can be created 300% faster using the Route Control Wizard.

1.5 What's New in SIMATIC Route Control V6.1 SP1 ?

Note

The tasks involved in migrating V6.1 projects to V6.1 SP1 are described under:

Migration V6.1 to V6.1 SP1

Route Control Applications in the Hardware Configuration (HW Config)

Prior to V6.1, users had to configure a standard application for the Route Control server in HW Config. The Route Control Wizard asked for this application when exporting objects to the Route Control Engineering project. As of V6.1 SP1, special SIMATIC Route Control applications are configure in HW Config. The following applications are offered for Route Control:

- RC application
- RC application (standby)
- RC application client

An RC application is the preferred station (server master) for Route Control. A WinCC application and/or Batch application can also run on this station. Following a switchover, this station becomes the standby station for all applications running on it (see also Route Control Redundancy).

An RC application (stby) is the substitute station (server standby) for Route Control. A WinCC application (stby) and/or Batch application (stby) can also run on this station. Following a switchover, this station becomes the master station for all applications running on it (see also Route Control Redundancy).

An RC application client represents a station on which a Route Control Center (client) is installed. The RC application is needed to load the Route Control based configuration (one or two computer names for the Route Control servers) to the client station.

See also:

- Route Control Applications (HW Config)
- Route Control Configurations
- Route Control Configurations (non-redundant)
- Route Control Configurations (redundant)

Downloading the Configuration to a Route Control Client

Once the Route Control server application(s) are configured, this information can be downloaded to a Route Control client. This configuration with the names of the Route Control servers replaces the previous selection dialog in the Route Control Center application. An RC application client should be marked in the SIMATIC Manager S7 project for downloading the configuration. You then right-click on it and select the context menu command "Download".

See also:

- Route Control Center: Selecting a Route Control Server

Maintenance

The Route Control server process and the Route Control Center application are linked to the maintenance components of PCS 7 (Station Observer). In this version, therefore, you can monitor the computer-based properties such as hard disk space and available RAM. Parameter specific to Route Control are not monitored.

PCS 7 Standard Redundancy for Route Control Server

The Route Control server process is now at all times linked to the PCS 7 standard redundancy monitoring (Redundancy Control). Route Control therefore runs in a network with the applications WinCC and/or SIMATIC Batch Server and can be switched together with these as a group. A connection is required for the two servers to monitor each other. The monitoring of the redundant processes and the switchover of the redundancy status between the computers must be guarantee in any case. We therefore recommend a serial connection between the two computers (and for SIMATIC Batch).

See also:

- Route Control Configurations (redundant)

Additional Operator Languages

In addition to the languages German, English and French mentioned above, Route Control now also supports Italian and Spanish as GUI languages for the Route Control Tools and as operator languages. Chinese (Simplified) is also supported for Asia. The required modules for Chinese (Simplified) are installed on the target system by a separate PCS 7 setup routine (DVD).

List of Additional Changes between V6.1 and V6.1 SP1

Block

- FB 800 (RC_IF_ROUTE)
  The MAN_AUT input now has another logic for the values 0 and 1 and is therefore now like all other blocks of STEP 7 and Route Control. The input is now named AUT_MAN instead of MAN_AUT. The @PG_RC_IF_ROUTE_STANDARD.PDL picture has been correspondingly adapted.
- FB 825 (RC_IF_VAL_MOT) and FB 827 (RC_CE_COMMON)
  The QAUTO_OC signal has been moved from Q_C_00 to Q_C_01.
- FB 808 (RC_IF_VOLUME)
  The texts for the "QSUMMED" output were swapped and have now been corrected.
- New data structures:
  FB 800 and therefore also FB 852, FB 853, FB 854, FB 855, FB 856, FB 857, FB 858, FB 859, FB 860 (these blocks "take on" the data structure of FB800, i.e. must therefore be recompiled!)
- Adaptation of the logic:
  FB 800, FB 852 and FB 857 used the input and were adapted to the reversed logic using an internal Temp variable!

- Maintenance inputs at the FB 850 and FB 800 blocks have a new data structure:
  FB 800 and therefore also FB 852, FB 853, FB 854, FB 855, FB 856, FB 857, FB 858, FB 859, FB 860
  (these blocks "take on" the data structure of FB800, i.e. must therefore be recompiled!)
- New inputs:
  FB 850

WinCC pictures

- The tooltip for the RC block icon has been modified and now no longer cuts off the full text at (@PCS7TypicalsRC.PDL). You need to reinsert the @PCS7TypicalsRC.PDL file in your WinCC project for existing WinCC pictures.

No additional windows open when enlarging the Route Control faceplates in WinCC.

2 Product Introduction

2.1 Route Control

2.1.1 What Is Route Control?

SIMATIC Route Control is a SIMATIC PCS 7 programming package for automated transport of materials and products in plants. Route Control encompasses both the project engineering and the runtime system and provides many interfaces to the PCS 7 basic system and to user programs.

Route Control can provide everything from simple transport processes to a large number of complex route combinations, depending on the plant design. Route Control is primarily a tool for simplifying and standardizing the project engineering, processing, and diagnostics of material transports (routes). Route Control is used to define, test, activate, and monitor a route associated with a route request (from the material source to the destination location via partial routes).

Route Control has the following features:

Project Engineering

- Simple project engineering and interconnection of process-related elements in CFC
- Wizard-assisted project engineering of cross-coupling among the relevant automation systems for Route Control
- Wizard-assisted project engineering of parameters for the connection between Route Control automation systems and Route Control servers
- Transfer of elements from an S7 project (CFC) to the Route Control project engineering
- Insertion of elements in partial routes per drag-and-drop operation
- Interface in CSV file format for efficient configuring of partial routes using external tools such as MS Excel.

Runtime System

- Multilevel activation of transports
- Automatic route search, combination of all partial routes and the elements they contain
- Control and monitoring of routes and associated elements
- Comprehensive diagnostics of routes and elements, including messages related to a route
- Redundant configuration of the Route Control server for high availability

Note

The SIMATIC Route Control system is intended for transport of products and materials and is not intended for automation of packaging sectors or package tracking.

2.1.2 Functions of Route Control

Route Control assists you in all stages of material transport process automation. Route Control functions are divided into the following areas:

- Route Control project engineering interface for creating and managing any number of partial routes with elements
- Route Control Wizard within the context of the SIMATIC project
- Block icon containing a WinCC faceplate for insertion in WinCC pictures and operator control and monitoring of a route
- Route Control Center for detailed diagnostics of a route and its elements
- Route Control server, which can be configured redundantly, for executing route searches and to serve as the interface between the Route Control Center and the automation systems
- Route Control library with interface blocks for interconnection with user blocks and other process blocks

2.1.3 Migration of Older Projects

For migration of Route Control projects created in the following earlier versions:

- *Route Control based on PCS 7*
- *Route Control based on BRAUMAT / SISTAR*

Consult the Overview in the Migration section.

A description of the migration from V6.0 to V6.1 is available in the section Migration V6.0 to V6.1.

2.2 Components of Route Control

2.2.1 Overview

Route Control comprises the following components:

Route Control library

Route Control Wizard

Route Control Project Engineering

Route Control Server

Route Control Faceplate

Route Control Center

2.2.2 Route Control Library

The Route Control library consists of a number of function blocks and data blocks to operate the route controller and link external blocks:

- Route Control interface blocks for routes and elements
- Route Control interface blocks for configuration and diagnostics of cross-coupling
- Route Control kernel blocks for the AS-AS and AS-OS connections as well as route execution

A list and description of all blocks can be found in the following sections:

Overview of Element

Overview of Remote Blocks

Overview of Cross-Coupling Blocks

Overview of Kernel Blocks

2.2.3 Route Control Project Engineering

The Route Control project engineering covers a number of steps:

- Transfer of elements, routes, and automation systems from an S7 project
- Expanded project engineering of user-defined element types
- Assignment of locations in the route network
- Project engineering of mode tables and function IDs
- Input of partial routes in the route network
- Interconnection of elements with partial routes and mode level assignment
- Input of materials, material groups, and permitted sequential relationships between materials
- Interface for exporting and importing elements and partial routes using a CSV file

For early diagnostics, the Route Control project engineering has a "test application for routes." With this tool, checks can be performed at the project engineering stage to determine whether routes can be found between particular locations, and what elements they contain. Information that is not available until runtime, such as whether an element is faulty or must be operated manually, cannot be taken into account here.

In addition, the entire project engineering for the route network (that is, the partial routes and their elements) can be checked for consistency. This consistency check includes the following elements:

- Element IDs
- Sorting order of elements
- Variants (intermediate transition locations of partial routes)
- Element activation (consistent activation of the same elements in the same mode level)

The Route Control server is also loaded from the project engineering application, whereby the new project engineering must then be activated by means of the Route Control Center (protected by user authorization).

2.2.4 Route Control Wizard

The Route Control Wizard helps the user perform a number of tasks for project engineering of Route Control and the associated S7 project.

- Assignment of unique element and route IDs, including a plausibility check
- Creation and consistency check of S7 connections for Route Control automation systems
- Export of configured elements, routes, and the plant hierarchy to the Route Control project
- Selection of the WinCC message server for Route Control server messages
- Project engineering of plant configuration and Route Control server properties

For additional information, see Route Control Wizard: Actions.

2.2.5 Route Control Server

The Route Control server performs the following tasks:

- Searches for a suitable path through the route network
- Downloads the element list to the automation system
- Provides a display of routes and elements for the clients (Route Control Center)

The Route Control server can be used in a redundant configuration.

2.2.6 Route Control Center

The Route Control Center offers the most extensive options for controlling routes because it displays detailed information on a route or multiple routes.

The Route Control Center can be called from a WinCC picture by means of the Route Control faceplate or from the Windows Start menu.

Starting the Route Control Center from the faceplate will display information about one specific route, unless overlapping routes - several routes using the same function ID - are involved.

Starting the Route Control Center from the Window Start menu displays a list of all routes from which the user can select the required route. The elements and their properties are then displayed for the selected route.

2.2.7 Route Control Faceplate

The Route Control faceplate comprises two parts:

- A block icon integrated in WinCC pictures that enables the user to open a control dialog and display preliminary information on the route status.
- Control dialog (WinCC faceplate) for route control and diagnostics

The following applications can be called from the control dialog:

- Route Control Center*
- Batch Control Center*
- SFC dialog displaying the SFC (user program SFC) for the route**

* Provided these applications have been installed on the computer

** Provided the SFC path has been configured

2.2.8 Route Control Route Log

Operator input by means of the RC faceplate or the RC Center, as well as status messages for routes and for the RC server are now recorded in a log.

For more information, refer to Route Log.

2.3 Configuration Possibilities

2.3.1 Client/Server Architecture of Route Control

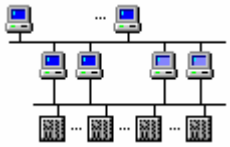
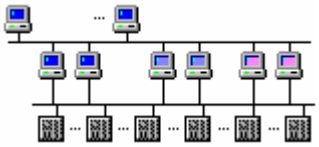
Route Control provides a separation between the client applications and user interfaces (block icon, control dialog/faceplate, and Route Control Center) and the server application (Route Control server).

It is possible to operate the client applications (Route Control Center) and the Route Control server application on the same computer, although it is recommended that these applications be separated, especially when used in relatively large plants.

2.3.2 Distribution of Route Control Applications

Route Control can be scaled to various levels. In principle, Route Control supports the same number of clients as a PCS 7 OS server.

No.	Figure	Level	Description
1		Standalone system	Client/server computer: Route Control server Route Control client WinCC client and Route Control block icon with control dialog WinCC server
2		Client-server standalone	Client computer: Route Control client WinCC client and Route Control block icon with control dialog Server computer: Route Control server WinCC server
3		Client-server redundant	Client computer: Route Control client WinCC client and Route Control block icon with control dialog Server computer (1): Route Control server 1 WinCC server 1 Server computer (2): Route Control server 1 WinCC server 2

No.	Figure	Level	Description
4		Client-server redundant separate server applications WinCC Route Control	Client computer: Route Control client WinCC client and Route Control block icon with control dialog Server computer (1): Route Control server 1 Server computer (2): Route Control server 2 Server computer (3): WinCC server 1 Server computer (4): WinCC server 2
5		Client-server redundant separate server applications WinCC Route Control BATCH	Client computer: Route Control client WinCC client and Route Control block icon with control dialog Server computer (1): Route Control server 1 Server computer (2): Route Control server 2 Server computer (3): WinCC server 1 Server computer (4): WinCC server 2 Server computer (5): BATCH Control server 1 Server computer (6): BATCH Control server 2

2.3.3 MES Interface

This version of Route Control cannot be connected to the MES system, for example, SIMATIC IT.

2.4 Installation

2.4.1 Readme File with Updated Information

Readme File

Note

Refer also to the latest information in the PCS 7 Route Control Basis readme.wri file provided on the software CD.

To Open the Readme File:

- Double-click PCS 7 Route Control Basis - readme.wri on the CD-ROM or
- open the file with the Windows Start menu command: Start > SIMATIC > Product Notes > SIMATIC Route Control - Readme.wri

2.4.2 Delivery Form

2.4.2.1 Delivery Form of Route Control

Introduction

SIMATIC Route Control V6.1 is provided on a DVD together with PCS7. You can select a client, server or engineering station for the installation and also specify which applications should run on the stations. Refer to the documentation and installation for PCS7 in this regard.

The licenses for the individual Route Control Application Center, Server and Engineering Tool are not included on the PCS7 DVD and must be ordered separately, see also Authorization (Overview)

Delivery Form

Route Control V6.1 also offers the following packages as before:

- Route Control engineering
- Route Control Center
- Route Control Server 30 routes
- Route Control Server 100 routes
- Route Control Server 300 routes

2.4.3 Setup

2.4.3.1 Installing Route Control Components

Installation

As of V6.1, the installation program for SIMATIC Route Control is part of the PCS 7 system setup. The PCS 7 system setup is called using the standard procedure for software installation in Windows.

Note

Refer also to the notes on installing Route Control in the readme.wri file for SIMATIC Route Control. You can also find the readme file in the Setup directory for Route Control.

Component Installation Options

As of SIMATIC Route Control V6.1, the installation program for Route Control is called "silently" by the PCS 7 system setup, that is, no action is required by the user during the installation.

With the basic package, the following applications are offered at the start of installation. Applications to be installed can be selected here.

- Route Control engineering
- Route Control single station
- Route Control server
- Route Control client
- User-defined installation

The Route Control Basis setup (basic software) is installed automatically and therefore does not need to be selected.

Removing Route Control

As with other PCS 7 components, Route Control is removed using a routine that can be called from the Windows Control Panel (Add/Remove Programs).

Installation in a Redundant System

Note

A number of special features must be taken into account in a redundant PCS 7 system. For a detailed description of the installation, refer to the "Redundancy" section and Installing an Authorization.

2.4.4 Installation Requirements

2.4.4.1 Hardware and Software (ES, OS)

Recommended PC Hardware Configuration for PCS 7

Note

For the latest status, refer to the PCS 7 description. The information presented here is only a copy of the PCS 7 description.

- SIMATIC Route Control V6.0 was based on PCS 7 V6.0 SP2.
- SIMATIC Route Control V6.0 SP1 is based on PCS 7 V6.0 SP3.
- SIMATIC Route Control V6.1 based on PCS 7 V6.1
- SIMATIC Route Control V6.1 SP1 based on PCS 7 V6.1 SP1

To use the new PCS 7 V6.1 functionality and for use of a larger quantity framework, we recommend at least the following PC hardware performance specifications:

	Clock Rate	Main Memory (RAM)	Hard Disk
Engineering station	2 GHz	1 GB	60 GB
RC client without WinCC	500 MHz	256 MB	30 GB
RC client with WinCC	1 GHz	512 MB	40 GB
RC server	2 GHz	1 GB	60 GB
OS single station (WinCC, RC)	2 GHz	1 GB	60 GB
OS single station (WinCC, RC, batch server)	> 2 GHz	1 GB	60 GB

Note:

- When using multiproject engineering, it is helpful to use PCs with a higher clock rate and more RAM and hard disk space than are recommended for an engineering station. It is also helpful to use faster disk drives in this case.
- A relatively large primary storage (RAM) configuration is helpful for archive servers.
- For BATCH servers, a clock rate greater than 2 GHz and use of a dual-processor system is recommended.

Setting System Partition C

Partition C (for operating system and PCS 7) should be set to at least 8 GB.

Hardware Requirements

The following hardware is required for PCS 7 V6.1 to work with Route Control.

Route Control also requires:

- Approximately 150 Mbytes of available hard drive space for the files to be installed. Additional memory is required for projects and the project database.
- A printer to output configured data (partial routes, elements, etc.). Any printer with graphics capability that is supported by Windows can be used.
- The software has been tested with an HP Laser Jet printer.

Software Requirements

Route Control requires the PCS 7 operating system for client and server.

The following software is required to use Route Control components:

Component	Property
PC operating system	Microsoft Windows 2000, Windows XP Prof. SP1 or Windows 2003 Server
Internet Explorer	Microsoft Internet Explorer V6.0 SP1
TCP/IP configured	See Windows system settings
CFC	Installed as part of PCS 7 setup
ACE	Installed with Route Control
SIMATIC logon	Optional
WinCC	Installed as part of PCS 7 setup

Readme File

Note

Refer also to the SIMATIC Route Control readme.wri file on the software CD to obtain the latest updates.

SFC Typical

Note

If SFC is not installed on the computer, an error message is displayed when the Route Control library is opened, and you cannot use the SFC typical for Route Control. This does not affect project engineering of the other Route Control blocks with CFC.

2.4.4.2 Hardware and Software (AS)

Hardware Requirements for Automation System

Route Control supports CPU types 416 and 417:

- CPU 416-3 (caution: smaller quantity framework, approximately 30 routes)
- CPU 417-4
- CPU 417-4H (new in V6.1)

Note

Two CPUs/two CPs on one rack is not supported.

Software Requirements for Automation System

Route Control requires CPU firmware Version 3.1.0:

- CPU 416-3
- CPU 417-4
- CPU 417-4H

2.4.4.3 Dependence on Other Components

All components required to operate Route Control are installed during the PCS 7 setup.

Route Control Server

- SIMATIC Net (server-AS connection)
- ACE (Application Communication Environment, connects Route Control server to WinCC message server)
- Redundancy Integration
- PCS 7 Common Classes classes (display of date / time etc.)
- SIMATIC Logon (optional)
- Acrobat Reader (for user manual)

Route Control Library

- STEP 7 / CFC
- Acrobat Reader (for online manual)

Route Control Faceplate

- WinCC
- Acrobat Reader (for online manual)

Route Control Center

- SIMATIC Authorization
- SIMATIC Logon (optional)
- Acrobat Reader (for online manual)

Route Control Engineering Tool

- SIMATIC Authorization
- SIMATIC logon
- Acrobat Reader (for online manual)

2.4.5 Authorization

2.4.5.1 Authorization (Overview)

The following table provides an overview of the applications of SIMATIC Route Control and their licenses. Additional information is available online at http://support.automation.siemens.com. The V6.1 licenses can continued to be used for SIMATIC Route Control V6.1 SP1.

Target station	License	Capacity
Server 30 routes	Single	V6.1 full version
	Single	V6.1 upgrade from V6.0
Server 100 routes	Single	V6.1 Powerpack
	Single	V6.1 upgrade from V6.0
Server 300 routes	Single	V6.1 Powerpack
	Single	V6.1 upgrade from V6.0
Engineering	Floating	V6.1 full version
	Floating	V6.1 upgrade from V6.0
	Rental	V6.1 full version (150h)
Client	Floating	V6.1 full version
	Floating	V6.1 upgrade from V6.0

Note

The software can be used for up to 14 days without a license for testing and evaluation purposes. The software offers the full range of functions, performance and capacity but a dialog appears informing the user about the installation of a license. The license key can be later installed without having to reinstall the software. However, the software is fixed to the individual computer and no claims can be made for damages and liability during this evaluation period. The evaluation period for each software program can only be used once.

SIMATIC Route Control offers a "floating license" for the RC Center as of V6.1. This allows you to install the software on any number of clients and use as many RC Center client applications as you have purchased licenses. Floating licenses are managed on a central license server. Refer to the documentation for the Automation License Manager / ALM for more information.

2.4.5.2 Required Authorization

Authorization

An authorization is required to use the Route Control software. That is, software protected in this way can only be used without information dialogs if the required authorizations for the software are detected on the hard disk (or in a license server for floating licenses) of the relevant programming device or PC.

Installing and Removing an Authorization

To install an authorization, you need the copy-protected authorization diskette provided with the relevant software package. The permitted number of authorizations is indicated by an authorization counter on the authorization diskette. The counter decreases by 1 for each authorization used. If the counter value stands at "zero," this diskette can no longer be used for installing authorizations.

The procedure for installing and removing authorizations for Route Control is the same as for PCS 7 and the PCS 7 option packages. Detailed information about installing and using authorizations can be found, for example, in SIMATIC Manager Basic Help.

Readme File

Note

Refer also to the readme file on the software CD for the latest information about Route Control. See Readme File with Current Info

Overview of Required Authorizations

Different authorizations are required for the different components of Route Control. An overview is available under Authorization (Overview).

Note

Material transports are also active routes that use an ID and, thus, a resource for this purpose. Inactive routes do not have an ID and are therefore not included in the number of material transports. However, as soon as these routes become active and use an ID, they are counted in the limit check for material transports.

2.4.5.3 Installing an Authorization

The authorizations for SIMATIC Route Control applications are installed using the Automation License Manager. Start the ALM with the Windows Start menu command **Start > SIMATIC > License Management > Automation License Manager**).

Note

To install the initial license on the Route Control server:

a) Transfer the license (30 routes) to the computer.

b) Start the Route Control server application.

To install the upgrade license on the Route Control server (stand-alone):

a) Exit the Route Control server application.

b) Transfer the license (30 → 100 routes) to the computer.

c) Optional: Transfer the license (100 → 300 routes) to the computer.

d) Restart the Route Control server application.

To install the upgrade license on the Route Control server (redundancy):

a) Exit the Route Control server application (standby).

b) Transfer the license (30 → 100 routes) to the computer.

c) Optional: Transfer the license (100 → 300 routes) to the computer.

d) Restart the Route Control server application (standby).

e) Switch computers (standby → master or master → standby).

f) On the computer that is now the standby computer, follow the procedure from b) to c).

g) Restart the Route Control server application (standby).

h) Optional: Switch the standby computer back to master mode (as in the beginning).

Upgrade from V6.0 to V6.1

a) Exit the Route Control server application.

b) Installation of Route Control Server V6.1

c) Transfer of the license to the computer

d) Migration of the V6.0 configuration to V6.1

e) Restart the Route Control server application.

f) Download of the configuration to the server

With redundant servers, both computers must be updated to V6.1.

2.4.5.4 Missing Authorizations

If a license is not found when an application is started (RC Engineering Tool, RC Center), a nag box will keep appearing, prompting the user to install the license.

See Missing Authorizations for the Route Control Server for an explanation of the Route Control server action in this case.

2.4.5.5 Missing Authorization for Route Control Server

Server License Is Installed

If the Route Control server process detects a license for 30, 100, or 300 material transports during startup, then the maximum number of simultaneous material transports will be restricted to this number. If the server then receives a route request number 31, 101, or 301, a message is sent to the message system. The Route Control Center displays a warning dialog at the operating stations indicating that the license is missing or the maximum number of authorizations has been exceeded. This dialog appears at relatively short intervals (approximately every minute).

The Route Control server continues to run, and the route request that caused the limit violation is answered with a route request error sent to the automation system.

Server License Is Not Installed

If a license is not installed on the computer on which the Route Control server is operating, the server is restricted to 300 material transports (maximum limit). Because the Route Control server does not have any information about the actual size of the plant, it allows the plant to operate even if the license is missing. However, the missing license is still indicated on the Route Control Center when the Route Control Center is first opened and then as a warning dialog appearing at regular intervals. If the license is installed at a later time, the Route Control server must be restarted.

Note

The license is scanned during server startup and server switchover in the case of redundant operation. The license is not verified during server operation.

2.4.6 User Authorizations

2.4.6.1 Authorization Management

The user groups required for Route Control have already been created in the setup. These groups must be created on the computers on which authorization management for Route Control is to operate. Users must be created and assigned to user groups manually. This usually requires administrator rights for that computer.

In Route Control, specific authorizations are assigned to user groups and cannot be changed. Route Control uses the PCS 7 component *SIMATIC Logon* to verify access authorization.

2.4.6.2 Action when Logon Component Is Not Installed

a) Logon Service Is Not Installed

If the Logon Service is not installed, all operations are possible.

Reason: The Logon Service is an optional package that the customer can purchase. Some customers do not wish to use this component, but they must still be able to operate systems that do not have the Logon Service.

Note

Be aware that specific rights are needed for Windows users for sharing and accessing directories even when SIMATIC Logon is not being used. This applies to the following shared directories:

- RC_LOAD directory on the Route Control server
- RC_LOAD directory in the Route Control Center (client)

b) Logon Service is Installed

b1) If this service is installed, the Route Control components prompt the user, and the functions must be enabled or disabled according to the group and role authorizations.

b2) If the Logon Service is installed, but an error occurs during the user prompt, the user is notified of the error (in a dialog box) and the authorizations/functions are disabled. The user must first correct the error (by reinstalling the Logon Service, Route Control, a hotfix etc.) in order for b1) to be applicable.

2.4.6.3 Introduction to Authorization Management

Route Control supports the central PCS 7 *SIMATIC Logon* user management, which draws on the basic user management mechanisms in Windows.

Basic Procedure

- Users, user groups, and passwords are centrally defined in Windows.
- For Route Control V6.0, the five relevant user groups in Windows are created during the setup.
- Route Control has standard user roles that cannot be expanded. These user groups are to be created on all computers on which Route Control is to operate with the user concept.
- A user can log on and off by means of the following applications: Route Control engineering tool, Route Control Center, and Route Control server. Route Control is also notified when a user logs on or off outside of Route Control. When such a change occurs, corresponding functions are enabled or disabled.

2.4.6.4 User Roles for Route Control

Five user groups must be created on all computers on which Route Control is to operate with the SIMATIC logon user concept:

- RC_ENGINEER
- RC_OPERATOR_L1
- RC_OPERATOR_L2
- RC_OPERATOR_L3
- RC_MAINTENANCE

These user groups must be created for:

- RC engineering tool (project engineering)
- RC Center
- RC server

Each group has specific authorizations within Route Control.

User Group	Authorization (Overview)
RC_ENGINEER	Engineering tool / used to load the RC server Direct restart and shutdown of server when the Route Control server is running on a computer without WinCC. Note: When the Route Control server is running together on a WinCC server, it is started and shut down with the WinCC project.
RC_OPERATOR_L1	Enables simple operations in the RC Center, including holding a route
RC_OPERATOR_L2	Middle authorization level; includes access operations such as re-requesting the same route

User Group	Authorization (Overview)
RC_OPERATOR_L3	Highest level of authorization for operating staff; product could become unusable or be lost; requesting a route with another source/destination, activation of a newly loaded Route Control project in the RC Center
RC_MAINTENANCE	Provides complete access, all authorizations, emergency personnel Enables server restart and shutdown

Individual authorizations in detail.

User Group	Authorizations (in Detail)
RC_ENGINEER	To open and modify project engineering
RC_ENGINEER	To load the RC server with a new project engineering
RC_OPERATOR_L1	Manual and automatic switchover
RC_OPERATOR_L1	To stop a route (corresponds to Request=0, Start=0)
RC_OPERATOR_L1	To reset a route request input
RC_OPERATOR_L2	To set a route request input
RC_OPERATOR_L2	To set/reset start input
RC_OPERATOR_L2	To set/reset hold input
RC_OPERATOR_L2	To acknowledge (positive edge)
RC_OPERATOR_L3	To set locations (source, via 1 to 10, and destination)
RC_OPERATOR_L3	To set the mode table
RC_OPERATOR_L3	To set the function ID
RC_OPERATOR_L3	To set the material
RC_OPERATOR_L3	To enable/disable solid transport
RC_OPERATOR_L3	To enable/disable ignoring of errors
RC_OPERATOR_L3	To adjust the option dialog
RC_OPERATOR_L3	To switch to another computer for redundant operation
RC_MAINTENANCE	All actions/operations/complete access
Unprotected	To update a route
Unprotected	To update elements

Special authorizations apply for the Route Control faceplate in the context of WinCC.

WinCC Level	Authorizations (in Detail)	RC User Group
5	Manual and automatic switchover	RC_OPERATOR_L1
6	To set/reset hold input	RC_OPERATOR_L2
5	To stop a route (corresponds to Request=0, Start=0)	RC_OPERATOR_L1
6	To acknowledge (positive edge)	RC_OPERATOR_L2

Only the first two user levels are relevant for the Route Control faceplate in WinCC; the highest authorization level (RC_OPERATOR_L3) is not.

2.4.6.5 Defining User Authorizations

Requirements

SIMATIC Logon is installed on every computer with a Route Control application. *SIMATIC Logon* comprises two components:

- SIMATIC logon administration tool
- SIMATIC logon service (runtime component)

Basic requirement for working with *SIMATIC logon*:

- Creation of the Logon_Administrator and Extended_Logon_Administrator groups in Windows is mandatory. However, these groups only need to be created once per computer for all SIMATIC components, such as BATCH or Route Control. Only users of one of these two groups can open the SIMATIC Access Control application and define user roles. Because Route Control V6.0 is based on these five specific user groups, additional groups do not need to be created for Route Control in SIMATIC Access Control.

Defining Users and User Groups

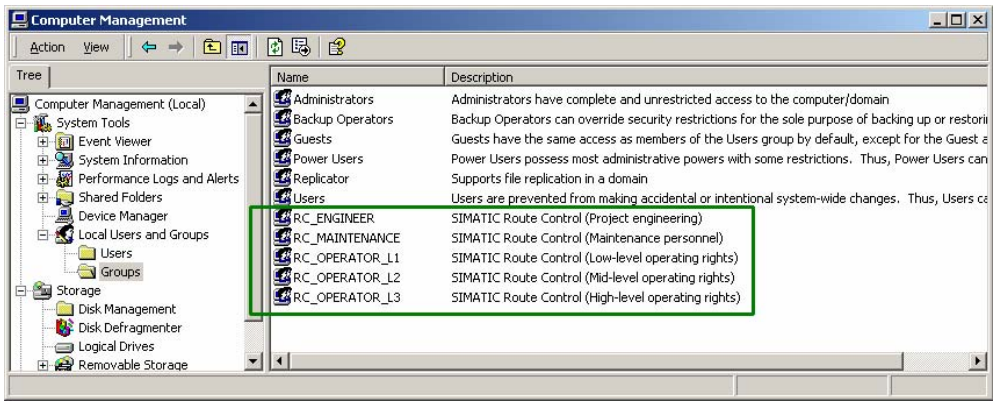
1. Open the user administration in one of the following ways:
   a) In the control panel, select Users and Passwords \ Advanced
   b) From the Computer icon on the desktop, select settings on the context menu
2. In Users \ New Users, create all users with a password and user groups in the Windows server.

Note

The Route Control setup creates the required groups during installation. You only have to assign the respective users to these groups.

If a domain server is available, the groups can be centrally managed there.

When Route Control is used in combination with SIMATIC Logon, the RC user groups must be created manually on the SIMATIC Logon server or domain controller.



Matching Windows User Groups and RC User Roles

The user groups in Windows must match the user roles in Route Control (identical character strings) - see above.

Changing User Authorizations

User authorizations cannot be changed in Route Control. Specific, permanent authorizations are assigned to the user roles or groups.

3 Getting Started

3.1 Getting Started

By performing the steps below in the recommended order, you will quickly become familiar with the product. The actions are reinforced by a series of links to sections offering further information on a topic.

1. Installation of PCS 7 (setup program)
   - Hardware and Software
2. Installation of Route Control components (ES, Server, Client)
   - Type of Delivery of Route Control
3. Creation of user groups in Windows (automatically performed by the Route Control setup)
   - User Roles for Route Control
4. Creation of a SIMATIC S7 project with at least one programmable controller (CPU) and one operator station
5. (WinCC)
   - Overview
6. Entering RC applications in HW Config
   - Route Control Applications (HW Config)
   - Route Control configurations
7. Copying Route Control blocks from the library and inserting them into the S7 project
8. CFC chart with one RC_IF_CFG and one RC_IF_XC_DIAG block (for more than one automation system)
   - Overview of Cross-Coupling Blocks
9. CFC charts for elements; insertion of RC_IF_xxx blocks
   - Overview of Elements
10. Per route: CFC chart containing one RC_IF_ROUTE block (this block is sufficient for manual operation of a route; for automatic operation, the RC_IF_ROUTE must still be interconnected to the user program, but this can be done later)
    - RC_IF_ROUTE (FB800)
11. Start Route Control Wizard with all options (Export)
    - Route Control Wizard: Actions

12. Compile CFC and download to an automation system (AS)
    - See PCS 7 manual
13. Compile NetPro and download to an automation system (AS)
    - Guide: Exporting the Connection Configuration (NetPro)
14. Start Route Control Wizard in the Route Control engineering tool (Import)
    - Route Control Wizard: Import
15. Project engineering of Route Control objects (assign project settings, locations, mode table, partial routes, interconnection of elements in partial routes, and in the case of dynamic ID assignment, the route ID for the dynamic IDs)
    - Starting the RC engineering tool
16. Configure the materials, material groups, and sequential relationships (optional)
    - Material (Overview)
17. SIMATIC Manager: Compile OS (AS-OS transfer)
    - See PCS 7 manual
18. Expand WinCC project: Create pictures, interconnect block icon to route instance (RC_IF_ROUTE)
    - Route Control: WinCC Wizard (Overview)
19. Start WinCC runtime
    - See WinCC manual
20. Load Route Control server
    - Loading the Route Control Server
21. From the WinCC picture, start the Route Control faceplate and Route Control Center by means of the block icon and control routes manually (manual test operation).
    - RC Block Icon (Display Elements)
    - RC Block Icon and Faceplate
    - Route Control Center: General Operator Control Elements

3.2 Important Notes

3.2.1 Restriction of Quantity Framework

Description

For Route Control, the full quantity framework of control elements and sensor elements cannot be utilized as intended. See also Quantity Framework for Route Control.

Cause

Route Control element blocks issue messages under the following conditions:

- If a fault occurs
- If an error occurs
- If the element transitions to manual mode

The AlarmS block (SFC18) is called for this purpose.

The number of calls is limited to 4,096 in PCS 7 (only with use of the new message concept). This limitation did not exist with the old message concept and in Version 5.

The total number of elements multiplied by the number of messages issued by these elements must not exceed 4,096.

Control elements of Route Control call this block for three different messages; sensor elements can generate two different messages. Parameter elements and linking elements do not create any messages. In addition, it must be noted that all program sections in one automation system share these resources. That is, the limit of 4,096 calls must not be exceeded in total.

Calculation Formula

Number of calls for Route Control = Number of control elements * 3 + Number of sensor elements * 2

Examples

Number of Control Elements	Number of Sensor Elements	Total Number
1.024	512	4.096
512	1.024	2.560
680	1.024	4.088

From our experience, this number of control elements has never been reached in *one* automation system. Because other programs besides Route Control are also being executed, such quantity frameworks are already distributed among more than one automation system for performance reasons.

3.2.2 Clearing/Resetting a WinCC OS

Note

If a transfer was made to a WinCC OS with a clear/reset operation (AS-OS transfer), the Route Control Wizard steps must be repeated with the "Selection of message server" option and the "Generate messages" option so that the Route Control server messages are regenerated in the WinCC project!

See Route Control Wizard: Actions and Route Control Wizard: Selection of WinCC Message Server

3.2.3 Enabling Changes

Note

If you make changes to the Route Control project engineering and load the changes onto the Route Control server, the changes do not become active until the next route request.

Example: You have incorporated additional elements in partial routes or modified properties.

3.2.4 SIMATIC BATCH and Route Control

Route Control can be linked to SIMATIC Batch. Available interfaces for this purpose are the RC_IF_ROUTE and SFC typical blocks, which are included in the Route Control library. Linkage of the engineering and runtimes systems is *not* included. Linkage of the recipe layer is not yet included in V6.1.

3.3 Libraries & Blocks

3.3.1 PLCSim

PLCSim is not supported by Route Control because PLCSim is unable to process BSEND/BRCV orders, which are required for communication between the Route Control automation systems and the Route Control servers. The communication between the Route Control server and the automation system is carried out over so-called "named connections" and BSEND / BRCV; a connection via MPI is not recommended.

3.3.2 Downloading Blocks to the AS (User Blocks)

Important note for importing blocks into the AS:

Caution

If you want to import a new version of Route Control blocks into the AS, you must follow the steps below:

Deactivate the routes in which the destination AS is involved by taking them into manual mode and deactivating them. This pertains to all routes for which the AS is the master or a slave.

Compile the blocks. Depending on whether the interface has changed from the previous version of the blocks (also pertains to parameter properties such as "S7_m_c=true"), the instance data block numbers can also change when the blocks are compiled.

Import the blocks.

Restart the Route Control server so that all of the data of the AS (most notably the instance DB number) are reestablished in the server through a general request.

Note

The data blocks of SIMATIC Route Control must not be read back from the automation system to the offline container of the project on the engineering station (ES). The offline container should always contain the original blocks from the Route Control library.

The pertains to:

Route blocks DB101 to DB400

Data block for cross-coupling of DB450 up to DB481 and DB751 up to DB781

Reason: If data blocks are read back from the automation system to the ES, the current image (status of a portion of the elements of this route) is uploaded. If these data blocks are subsequently downloaded to the automation system again and the route has already been deactivated on this AS, elements may become reactivated according to the latest image.

3.3.3 Downloading Blocks to the AS (Instance DB)

Objective

Blocks from a later version of Route Control (due to a bugfix, for example) will be compiled and downloaded to the AS. This involves two different cases:

- Block interface (for example, RC_IF_ROUTE) has not changed
- Block interface has changed

In the first case, the number of the instance block assigned to an instance of the RC_IF_ROUTE will not be changed. In the second case, a new number can result from the interface change and the automatic assignment of instance database numbers.

Problem

If the new function block and data block are imported into one automation system (AS), the peer automation systems of a route can still run. These peer automation stations have the instance data block number of their master route or master FB transferred to them at the beginning of the route and send constantly up-to-date data in this instance block after a route is started (PUT jobs).

If another instance data block is now downloaded to the master AS, the previous data block simultaneously becomes invalid or is even reassigned to an entirely different function block. There is a risk that data will be overwritten.

Solution

All routes involved in the AS to be reloaded must be terminated. This applies both to master routes in this AS as well as to routes for which the AS is involved as a peer (slave) only.

How Can the Routes Involved in this AS Be Identified?

Start the Route Control Center from the Windows start menu; this displays all of the routes. In the upper area, sort the list of routes according to the AS column. In the first column you see all of the route IDs next to the applicable AS. You can take all of the routes of this AS and manually terminate them.

Once the blocks are downloaded to the AS, you reset these routes to automatic mode. Because an AS can also be a peer AS (slave) to another AS involved in the route, the routes in the other AS must also be manually terminated. Route Control V6.1 provides a "Maintenance" overview which lists all automation systems and their status.

3.3.4 Renaming a Process Cell or a Unit in the Plant Hierarchy

Note

If you rename a process cell or a unit in the plant hierarchy of your S7 project, the Route Control Wizard cannot distinguish between a rename operation and a delete/create operation because a unique key does not exist internally. When importing to the Route Control project engineering, you are therefore asked whether the old process cell/unit is to be retained or deleted. If you choose to delete the process cell/unit, all of the locations and partial routes including the interconnected elements will be deleted with the process cell/unit.

Therefore, we recommend the following procedure:

- Rename the process cell/unit in the plant hierarchy (S7 project)
- Rename the process cell/unit in the Route Control project engineering
- Export the plant hierarchy from the S7 project using the Route Control export wizard
- Import the plant hierarchy to the Route Control project engineering using the Route Control import wizard

3.3.5 Adapting the Block Ranges (CFC)

Settings for the block ranges must be adapted because the blocks of SIMATIC Route Control are user blocks from the perspective of an S7 project.

See CFC - Adapting the Block Ranges

3.3.6 Optimization: Memory Requirements in the AS

Better use can be made of the memory in an automation system if unneeded blocks are deleted.

The blocks for the element list of a route have fixed block numbers that are assigned to route IDs according to the following rule:

Block number = route ID + 100

Route ID	DB No.
1	101
2	102
...	...
300	400

If either of the following applies to your project:

- You work only with particular fixed route IDs
- You have authorized particular areas for dynamic IDs

Then you can delete data blocks for route IDs that are not used in any of the automation systems. Example:

Route ID	DB No.	Note	AS1	AS2	AS...	AS n
1	101	Fixed ID	X	X	X	X
2	102	Fixed ID	X	X	X	X
3	103	Fixed ID	X	X	X	X
4	104	Fixed ID	X	X	X	X
5	105	Fixed ID	X	X	X	X
6	106	Fixed ID	X	X	X	X
7	107	Dynamic ID	X	X	X	X
8	108	Dynamic ID	X	X	X	X
9	109	Dynamic ID	X	X	X	X
10	110	Dynamic ID	X	X	X	X
11	111	Not used	-	-	-	-
...	...	Not used	-	-	-	-
300	400	Not used	-	-	-	-

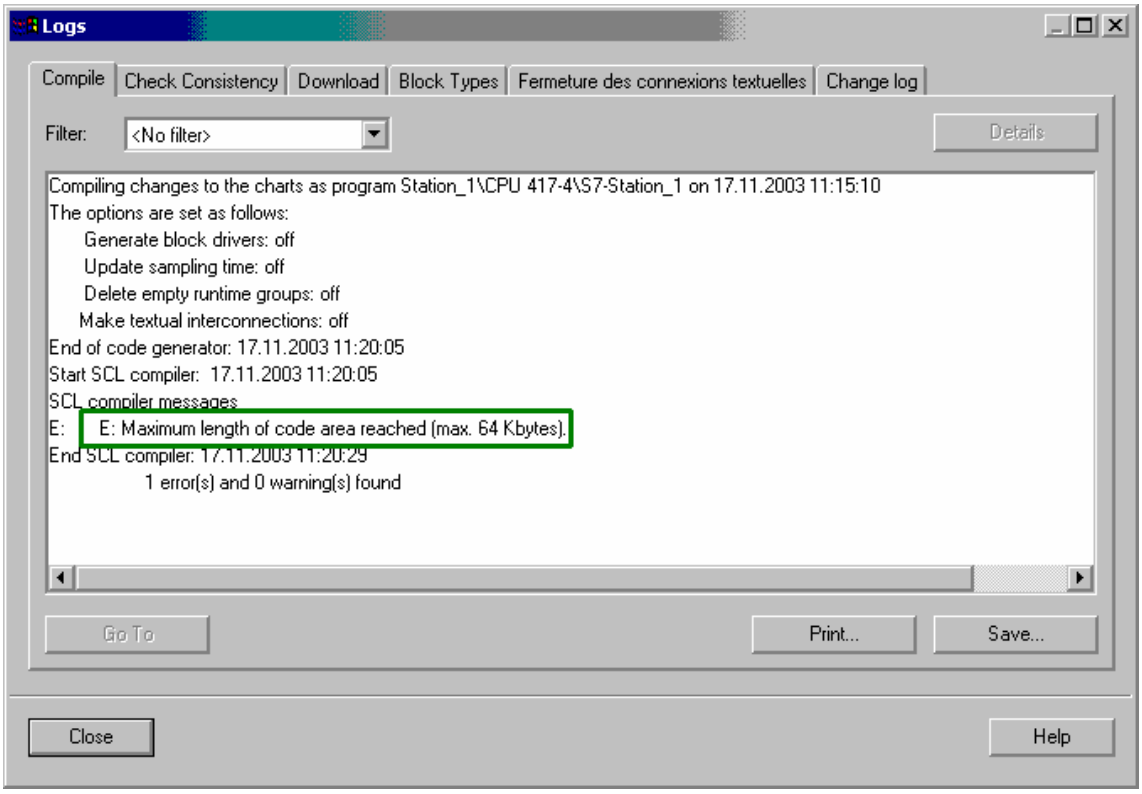
In this example, data blocks DB101 to DB110 must be present in all automation systems while data blocks DB111 to DB400 can be deleted.

But you must download data blocks to all automation systems if previously unused route IDs are now going to be used. This is the case if new route blocks are inserted in the CFC for an expansion to a project engineering and these route blocks do not operate with the route IDs previously available (dynamic ID assignment) but rather require their own separate route IDs (RC_IF_ROUTE).

3.3.7 Error Message for the SCL Compiler (CFC)

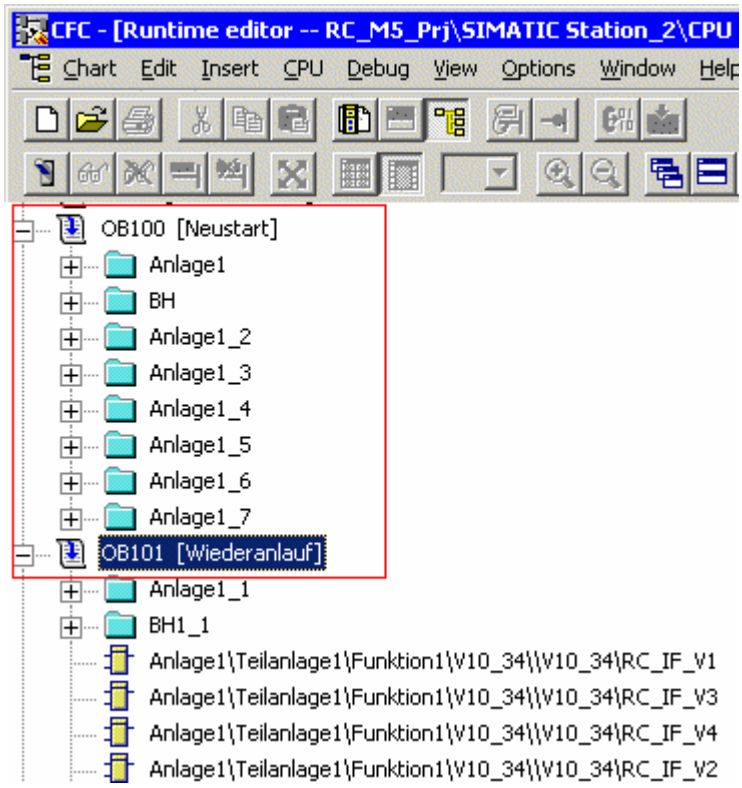
Problem

If compilation of the CFC charts is terminated with the message below, the reason is usually that too many blocks were inserted directly at the highest level of an organization block (example: interface blocks of elements in the startup organization blocks).



Solution

Create different runtime groups and distribute the block calls to these groups.



3.3.8 Installing a New Route Control Library

User Task

Your computer already has a project engineering environment for an S7 project and the Route Control project installed. Now you would like to install a more recent version of the Route Control library and update your project with the latest blocks.

Solution

1. Install the new Route Control library
2. From the "System-Blocks\Blocks" program folder in the Route Control library, copy the blocks that have been changed to your own program folder. To perform this procedure, refer to the readme file provided.
3. Perform a type import for Route Control blocks in CFC.
4. Now compile and download the charts.

Example

Check List

3.3.9 Copying RC_IF_ROUTE Route Blocks

If you copy charts to a CFC that contain blocks of type RC_IF_ROUTE (FB800) for which a route ID has already been assigned, you must manually set the input ID in the copy of the block to 0 in the copied chart. Otherwise, problems can result in the RC wizard if it detects the same route ID more than once, leaves the ID in the copied block, and tries to automatically correct the ID in the original block (possibly changing a correctly assigned route ID!).

3.3.10 Reserved Ranges/Block Number Limit

In the CFC editor, set the reserved ranges using the "Options / Settings / Compile and Download" menu command. See CFC - Adapting the Block Ranges. It is important that the upper limit setting be increased (DB to 899, FC to 899). You should also enter this setting globally in your master data library.

3.3.11 Procedure for Creating a New S7 Project with Route Control

1. Create a new S7 project
2. Copy the Route Control blocks from the RC library to the master data library of your S7 project (including the data blocks/DBs)
3. Also copy the data blocks and UDTs to the offline container of your S7 project
4. Required RC blocks are added to the AS block container (offline container) by using these FBs and FCs in CFC charts.

(Tip: To optimize the memory, delete any route data blocks in the range DB101 to DB400 that are not being used.)

Note

A master data library is only in multiprojects. For a single project, therefore, copy the blocks directly to the program container of the AS.

3.3.12 RC_IF_SFC (FB849) - Online Help

In the case of user blocks derived from FB849 (RC_IF_SFC), a jump to the online Help system is now possible because the "block family (S7_Family)" parameter was transferred correctly when the block was compiled by the CFC/SFC editor.

3.3.13 BSEND/BRCV vs. PUT

Question

Which communication (system blocks) is used by Route Control to exchange data between automation systems?

Answer

There are two cases:

- **If communication between the automation systems takes place within** the same Route Control project, Route Control uses so-called **PUT** calls. This specifies the connections, because the peer AS is then known.
- If data are being exchanged with automation systems from **another** Route Control project, Route Control uses **BSEND/BRCV** calls. The connections are **unspecified**, because the peer AS is not known.

Note

In the second case, elements of the other Route Control project are mapped in the first Route Control project using "proxy blocks," such as RC_IF_REMOTE_CE. The objective of this functionality is to be able to control **individual** elements from another area. It was not intended that a route be able to run in various Route Control projects across multiple automation systems.

Additional Information

Guide: Configuring AS-AS and AS-OS Connections

Guide: CFC Remote Elements

Remote Elements, CFC Example

3.3.14 STEP 7 Import/Export Assistant

If you wish to create models in the project library using the STEP 7 Import / Export Assistant but they do not yet include CFC charts, the range of the user blocks (FC/FB and DB) must be adapted first.

CFC Editor \ Options \ Settings \ Compile+Download...

See CFC - Adapting the Block Ranges

3.3.15 LOCK Input on Element Blocks

The LOCK input at the element blocks designed for interlocking elements currently has no function and is reserved for use in future versions.

3.3.16 Optimizing the Number of WinCC Tags

The "s7_m_c" attribute is set to "TRUE" for a few input and/or output parameters for interface blocks such as RC_IF_MOTOR in the Route Control library. This means that these parameters are created as WinCC tags during AS/OS transfer. However, if you do not wish to use these tags, for example, in WinCC pictures or for logging values, you can substantially reduce the number of WinCC tags by setting the "s7_m_c" value to "FALSE". We are currently studying if we should set the default value in the Route Control library to "FALSE" and have the user set it to "TRUE" as needed.

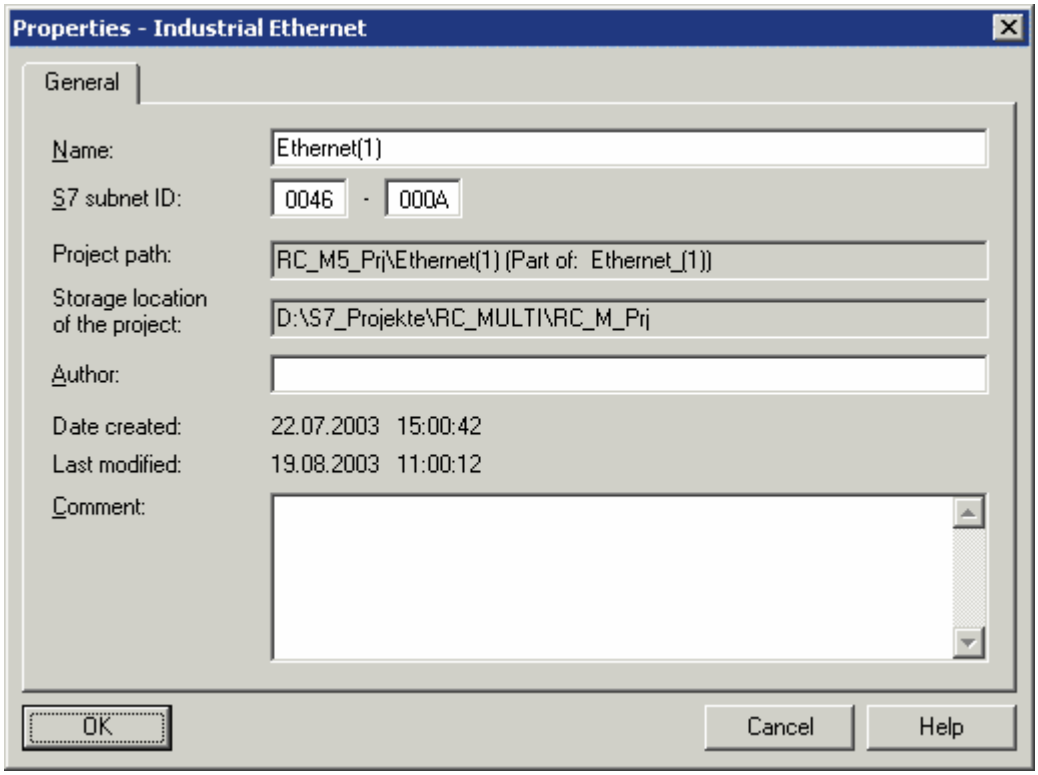
3.4 Wizard

3.4.1 Route Control Wizard: Start Requirements

The following requirements must be met to start the Route Control Wizard and create S7 connections:

1. All automation systems relevant for Route Control use either an IP address or a MAC address. A combination is not permitted.
2. If all automation systems relevant for Route Control use an IP address, the network parameters must be correctly assigned.
3. If in a multiproject, multiple automation systems are distributed among several individual S7 projects, the network properties (name of network, S7 subnet ID, see figure) must be identical in all of the individual S7 projects.
4. Because the Route Control Wizard has to access the S7 connection data and, if necessary, modify or reenter these data (write access), other applications having write access (HW Config, NetPro, etc.) must be closed.

See also Route Control Wizard: Same Properties as Industrial Ethernet

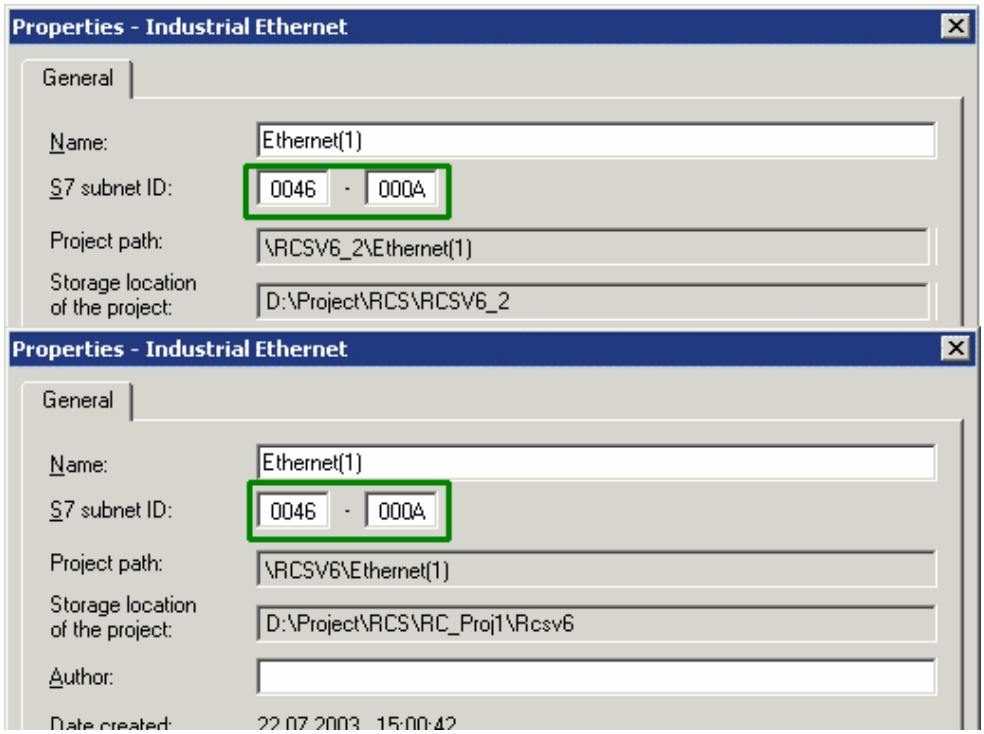


Note

Use the 'Project Synchronization' function of SIMATIC Manager to automatically adjust these settings for all projects as well as the individual projects of a multiproject.

3.4.2 Route Control Wizard: Same Properties as Industrial Ethernet

The figure below shows two different S7 projects (RCSV6_2 and RCSV6) for which the name and the S7 subnet ID must match.



3.4.3 Specifying the RC Server Computer Name and IP Address

Up unit version 6.1, you needed to enter an IP address for the RC server(s) in the RC wizard or configure a computer name. The computer name was required in order to download to the RC server from the the RC Engineering Tool (shared drive). The computer name of the server was also used by the wizard to correctly set the switches "WinCC-dependent startup" and "PCS 7 redundancy logon". See Global Settings.

As of V6.1 SP1, so-called "RC Applications" are configured in the hardware configuration which allows the Route Control wizard to automatically detect the stations where RC applications are running and other applications also running on these stations. As of version 6.1 SP1, you do not have to specify the computer names of the Route Control server or enter their IP addresses. These two gobal settings are determined automatically.

3.4.4 Chart-in-Chart Technology

If you are using chart-in-chart technology with CFC and you insert element (RC_IF_MOTOR etc.) or route (RC_IF_ROUTE) blocks, you should consider the maximum length of the object name that could result. The Route Control Wizard will transfer up to 250 characters to the Route Control project engineering. If this maximum length is exceeded, the Route Control Wizard issues a warning message (last dialog) and also generates an entry in the log file.

With longer character strings, the wizard uses the characters at the end of the text, i.e., it truncates characters at the beginning of the name if needed.

3.5 Configuration

3.5.1 Shared Directory 'RC_LOAD' on the RC Server

In order to be able to load a new project engineering onto the RC server, a shared directory is established as part of the setup (share name: RC_LOAD). The directory is used to load the Route Control project engineering on the Route Control server. Following installation it is then enabled for "all" and "complete access" for the five Route Control groups. Assign the appropriate users to the groups (RC_ENGINEER, RC_OPERATOR1, ..2, ..3 and RC_MAINTENANCE).

Both Route Control servers and the engineering station (Route Control Engineering Tool) read and write to this RC_LOAD directory. The RC Engineering Tool must therefore be operated by a user in the RC_ENGINEER group. The RC server must be started by one of the five user IDs.

Problems can arise when the Route Control Server is loaded from the Route Control Engineering Tool. In this case, a dialog is displayed prompting the user to check the RC_LOAD directory (enable / share) on the server. There is another known reason why the load operation can fail, which, however is not indicated by the dialog:

The drive on which the Route Control project engineering is located does not have enough available memory. You should therefore check the available memory on the relevant partition; at least 100 MB should be available.

3.5.2 Location as a Variant

Note

The "Variant" location property has been retained for compatibility reasons for Route Control Version 5 projects.

We recommend that a partial route be split up into two partial routes instead of configuring a location with the "variant" property.

Example:

Partial route A-B-C with B as a variant becomes two partial routes, A-B and B-C.

See also

Locations

Locations (Examples)

Locations (Properties Dialog)

3.5.3 Downloading the Server during an Active Route

The Route Control Center displays the elements of an active material transport. If the configuration is changed, by assigning a new element to a partial route, for example, and then downloading and activating the new configuration on the Route Control server, the Route Control Center will show the new element in the list although it has not been triggered in the automation system. This is due to the fact that the automation system is still working with an element list based on the previous configuration.

Solution

The new element is included as soon as the route is completed and started again. A new element list is then loaded in the automation system.

3.6 WinCC / Operation & Monitoring

3.6.1 Dynamic Wizard/Compiling the Script File for the RC Dynamic Wizard

If the dynamic wizard for the Route Control faceplate is not (yet) available in the WinCC graphics editor, it means that the wizard still has to be compiled.

Proceed as follows:

1. In SIMATIC > WinCC > Tools, open the dynamic wizard editor
2. In the toolbar, select the language: English, German, or French. Make sure that the same language is selected in WinCC (Options > Language). We had selected different languages in some cases in WinCC and the dynamic wizard editor, and the RC dynamic wizard could not be viewed in the WinCC graphics editor, in spite of the fact that the script had been successfully compiled.
3. Open the script for the RC dynamic wizard in the <Drive>\siemens\wincc\wscripts\wscripts.x\ directory, where x stands for the language: deu = German, enu = English, fra = French. The file itself is named RC_IF_ROUTE_<L>.wnf, where <L> also stands for the language: A = German, B = English, C = French.
4. Compile the script using the Dynamic Wizard > Create DWD menu command in the dynamic wizard editor
5. The script should be able to be compiled without errors and warnings, and a new tab ("RC faceplates") should appear in the "Dynamic Wizard" window.
6. A new tab ("RC Faceplates") should also appear in the WinCC graphics editor in the "Dynamic Wizard" window.
7. You can now work with the RC dynamic wizard.

3.6.2 Additional Installation of RC Software, WinCC RC Faceplate

If you previously created a WinCC project containing RC faceplates and now install a new version of Route Control (faceplate), you must open the C editor in your WinCC project and select "Regenerate header" on the Options menu. This recompiles the standard functions, including the Route Control scripts, and communicates them to the WinCC project.

This is necessary because it may not be possible to manipulate the newly installed RC faceplates with the old scripts.

3.6.3 Operating an RC Faceplate on an RC Server

If the RC faceplate is to be available on a computer where a WinCC OS has been installed (without installing an RC server), the RC faceplate setup (including RC base) must have been run on this computer beforehand. The RC faceplate setup installs script files and global functions required for the RC faceplate to function properly.

3.6.4 Online Help in the Route Control Center

The Windows Explorer can be opened from the online help to allow the user to access the file system – on operator stations this is not yet possible, however. Due to reasons of security the online help can no longer be accessed in the Route Control Center when this application has been opened through a WinCC picture. The online help in the Route Control faceplate has also been deactivagted. If you call up the Route Control Center from the taskbar, on the other hand, the online help is available since the Windows Explorer can also be called up from the taskbar.

4 ES Route Control Configuration

4.1 Configuration Preparation

4.1.1 Migration

This description of migration applies to Route Control projects that were implemented based on one of the two variants of Route Control V5:

Migration of "RCS-Based-on-PCS 7" Projects (V5.0, V5.2)

Migration of "RCS-Based-on-BRAUMAT" Projects (V5.2, V5.3)

Earlier versions of Route Control, such as the routing system of SISTAR / BRAUMAT V4.x, are not considered here.

Note

For a quick overview of the blocks that have changed, refer to Block Changes

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4.1.2 Block Changes

The following table provides an overview of the interface blocks in versions V5 and V6.

	Block Name V5	Block Name V6	Comments
	Configuration		
	Not available	RC_IF_CFG (FB850)	
	Route		
	RC_ROUTE_CM	RC_IF_ROUTE (FB800)	RC_IF_ROUTE: Simulated Idle State
	RC_ENCODER	RC_IF_ENCODER (FC800)	
	RC_DECODER	RC_IF_DECODER (FC801)	
	SFC		
	Not available	RC_IF_ROUTE_SFC (FB849)	See SFC: Overview
	Control Elements		
	RC_MOT_REV	RC_IF_MOT_REV (FB823)	
	RC_MOT_SPED	RC_IF_MOT_SPED (FB824)	
	RC_VAL_MOT	RC_IF_VAL_MOT (FB825)	
	RC_MOTOR	RC_IF_MOTOR (FB822)	
	RC_VALVE	RC_IF_VALVE (FB826)	
	RC_CE_COMMON	RC_CE_COMMON (FB827)	
	Sensor Elements		
	RC_SENSOR	RC_IF_SENSOR (FB845)	
	RC_CONDUCT	RC_IF_CONDUCT (FB846)	
	RC_SE_COMMON	RC_SE_COMMON (FB847)	
	Parameter Elements		
	Not available	RC_IF_VOLUME (FC808)	
	Not available	RC_IF_TIMER (FC809)	
	Not available	RC_PE_COMMON (FC810)	
	Linking Element		
	RC_LE	RC_IF_LE (FB828)	
	Cross-Coupling		
	Not available	RC_IF_XC_DIAG (FB884)	
	Not available	RC_IF_XC_LIFE (FC884)	
	Remote Elements		
	RC_REMOTE_CE	RC_IF_REMOTE_CE (FB821)	
	RC_REMOTE_PE	RC_IF_REMOTE_PE (FB843)	
	RC_REMOTE_SE	RC_IF_REMOTE_SE (FB842)	
	RC_REMOTE_RECV	RC_IF_REMOTE_RECV (FB833)	
	RC_REMOTE_SEND	RC_IF_REMOTE_SEND (FB831)	

4.1.3 Migration Steps

Different steps must be carried out, depending on which variant (PCS 7 or BRAUMAT) was used. The following table provides an overview:

Step	Based on PCS 7	Based on BRAUMAT
Conversion of the Route Control database	X	X
CFC chart: route block	X	x (new)
CFC chart: elements	X	x (new)
CFC chart: XC Config	x (new)	x (new)
Export/import of elements	x (optional)	x (new)
Configuration of RC server	x (new)	x (new)
WinCC pictures + faceplate	X	x (new)
User program (CFC)	X	x (new)
User program (STEP 7)	-	x (conversion to CFC)
Interface to BATCH (route block)	X	x (conversion to CFC)

Note

Because BRAUMAT did not make use of CFC, additional steps are required to create CFC charts for migration of BRAUMAT projects.

4.1.4 Migration of "RCS-Based-on-PCS 7 Projects"

Perform each of the following steps:

- Convert the RC project

4.1.5 Migration of "RCS-Based-on-BRAUMAT Projects"

BRAUMAT systems based on PCS 7 (that is, with blocks interconnected in CFC charts) are better suited for migration to SIMATIC Route Control than systems in which CFC charts are not used.

Note

Route Control does not support SIMATIC S5 modules.

Route Control Library (CFC Charts)

- RC_CALL must be replaced by RC_IF_CFG.
- Element blocks must be replaced by blocks from the Route Control V6 library. Be sure to use the correct element types in this process You must also be sure that element blocks are inserted in CFC charts for all elements that were previously interconnected in partial routes. This prevents any elements that have already been interconnected from having to be deleted during import into the Route Control project planning.
- The AS-AS connections are generated by the Route Control Wizard.

Route Control Project Planning

- Open the Route Control Version 5 project engineering with the Route Control engineering tool and convert the database to V6 format. The conversion tool will be called automatically.
- The elements will be transferred from the CFC charts to the Route Control project engineering using the wizard. Any elements that are not in the S7 project will be deleted.
- The activation masks and feedback values for the standard types can be retained
- The partial routes and their interconnected elements are retained
- Modify the global settings according to the earlier parameter files (so-called INI files)

Route Control Server

- The PCU server with a Route Control miniport is completely replaced by a Route Control server V6. In principle, BRAUMAT can be uninstalled on the server, and the Route Control server can be installed, as there are no persistent data that must be transferred from V5 to V6.
- A new project engineering is then loaded onto the Route Control server V6 by the Route Control engineering tool. This project engineering contains the settings for server-server communication and server-AS communication, as well as the settings contained in the previous parameter files (so-called INI files).

Route Control Block Icon and Faceplate

- Because Version 5 did not include a block icon or faceplate, you must now configure them in the WinCC pictures.

Route Control Center

- Uninstall BRAUMAT from the client computers and install V6. The Route Control Center does not need to be configured, and the Route Control server will be determined during the initial call or will be requested by the user.

4.1.6 Migration V6.0 to V6.1

Carry out the following steps to migrate a Route Control V6.0 project to V6.1:

1. Configure a PC station in HW Config for the Route Control server(s).
2. Set the PG/PC interface (SIMATIC NET setting) on the PC to internal (local).
3. Download the server PC station from HW Config,
   see Component Configurator.
4. Delete any old Route Control connections in NetPro (AS-AS and AS-RC server), the connections are generated again later by the RC Wizard.
5. Copy the blocks from the Route Control V6.1 library into your project (without FB849).
6. Perform a type import in PCS 7.
7. Start the Route Control Wizard and select the correct Route Control servers (Route Control Wizard: Adapting IDs).
8. Compile and download to the AS.
9. Compile the OS (due to named connections).
10. Start the Route Control Wizard with the 'Select message server' option.
11. Perform an OS delta compilation.
12. Perform an OS delta download.

4.1.7 Migration V6.1 to V6.1 SP1

Note

Due to changes made to the blocks in the Route Control library, the AS **cannot** be upgraded in RUN. Neither is it possible to only upgrade the software on a Route Control client / server without using the new blocks of the Route Control Library V6.1 SP1!

Carry out the following steps to migrate a Route Control V6.1 project to V6.1 SP1:

Adapting the PC Stations

In HW Config, **insert** the required Route Control applications in the PC stations operating as Route Control servers and Route Control clients. You will find the following RC applications under "PCS7_V61" profile in the "SIMATIC Route Control" folder:

- RC application
- RC application (standby)
- RC application client

For existing projects, **replace** the user-defined application configured for a Route Control server with an "RC application" and with a "RC application (stby)" on the standby server.

- First configure in V6.1 SP1 an "RC application client" for each PC station where a Route Control client application will run (Route Control Center). The configuration of an RC application client is not mandatory but if you do not do it now, you will have to manually select a Route Control server on the Route Control Center at runtime. An "RC application client" only needs to be planned for stations on which a Route Control Center will run. Other stations on which a WinCC application with the Route Control faceplates runs, do not need to be configured as "RC application clients". See also Route Control Applications (HW Config). The following table provides an overview of the old and new configuration schemes:

V6.1	V6.1 SP1	Meaning
User-defined application	RC application	Route Control server (master)
User-defined application	RC application (standby)	Route Control server (standby)
Not available	RC application client	Route Control client / Center

The correct computer name must now be entered in the properties of PC station in the S7 project. The Route Control Wizard will later read these computer names and enter them in the Route Control configuration. These server computer names will also be read when the configuration is downloaded to a Route Control client. The Route Control Center application uses these two computer names to find your Route Control servers (replaces previous selection dialog).

Adapting the Component Configurator

In the Component Configurator of the PC stations where a Route Control server process is running, replace the previously configured "User-define applications" with an "RC application" or an "RC application (stby)".

Changed Blocks in the Route Control Library

Now replace changed blocks in the offline block folder of each Route Control AS and perform a type import in CFC.

- FC 808
- FB 800, FB 852, FB 853, FB 854, FB 855, FB 856, FB 857, FB 858, FB 859, FB 860
- FB 850
- FB 825, FB827

Now compile the complete program in CFC and download the blocks to the AS (AS must be in STOP!).

WinCC Pictures

Copy the changed picture file for the V6.1 SP1 Route Control faceplate from the installation directory

- <drive and program directory> \ SIEMENS \ WINCC \ options \ pdl \ faceplatedesigner_v\

  into your WinCC project directory

- <project name> \ WINCPROJ \ <OSNAME> \ GRACS.

  The new faceplate is based on the changed interface of the route block, RC_IF_ROUTE.

AS-OS Transfer

Perform an AS-OS transfer (changes only) to publish the new texts of the input parameters in the OS project (for the faceplate). Due to the name change at FB800 (AUT_MAN -> MAN_AUT), the OS needs to be compiled and downloaded since the faceplate is "interconnected" directly to the input.

Compile the WinCC OS using the "Create/update block icons" option or replace the Route Control faceplates in the WinCC pictures manually with the new faceplate (based on your previous configuration).

Route Control Wizard

- Run the Route Control Wizard with the "Export" option. You are **no longer** asked to specify which "standard application" represents the Route Control server / and standby application. Now import the data into the Route Control Engineering Tool and download the changes to the Route Control server. The wizard always establishes the communication line between the "RC applications" instead of "User-defined applications" and the Route Control AS.

NetPro

Compile the NetPro configuration and download it to the AS.

Route Control Engineering

Open the Route Control Engineering project, import the changes (RC applications and their server computer names) and download the configuration to the Route Control server(s).

Route Control Server

- Activate the changed and newly loaded configuration as usual using the Route Control Center.

Runtime

- Activate the WinCC project and the Route Control server.

5 Block Library

5.1 Route Control Blocks

SIMATIC Route Control blocks can be categorized according to function and architecture. Blocks to be inserted into CFC charts begin with "RC_IF." Note also the following:

- Route Control Blocks (General)
- Route Control Blocks (Run Sequence)

	User Interface	**System/Kernel Blocks**	**Configuration Blocks**
Configuration	---	See Overview of Kernel Blocks	RC_IF_CFG (FB850)
Diagnostics for cross-coupling	---	---	RC_IF_XC_DIAG (FB884) RC_IF_XC_LIFE (FC884)
Routes	RC_IF_ROUTE (FB800) RC_IF_ENCODER (FC800) RC_IF_DECODER (FC801)	---	---
Local elements	RC_IF_MOTOR (FB822) RC_IF_MOT_REV (FB823) RC_IF_MOT_SPED (FB824) RC_IF_VAL_MOT (FB825) RC_IF_VALVE (FB826) RC_IF_LE (FB828) RC_IF_SENSOR (FB845) RC_IF_CONDUCT (FB846) RC_IF_VOLUME (FC808) RC_IF_TIMER (FC809) RC_IF_USER_CE (FB829) * RC_IF_USER_PE (FC807) * RC_IF_USER_SE (FB848) *	---	---

	User Interface	System/Kernel Blocks	Configuration Blocks
Remote elements	RC_IF_REMOTE_CE (FB821) RC_IF_REMOTE_SE (FB842) RC_IF_REMOTE_PE (FB843)	---	RC_IF_REMOTE_SEND (FB831) RC_IF_REMOTE_RECV (FB833)
Special blocks	RC_IF_ROUTE_SFC (FB849) See SFC: Overview	---	---

5.2 Route Control Blocks (General)

The format is identical for all block descriptions. Meaning of the sections are as follows:

Block Description Heading

Here you find the type name of the block. The type (FB, FC, DB, UDT) and number of the block is in parentheses.

Description

Here the block function is briefly described.

Inputs and Outputs

The connections provide the data interface of the block. You can use this interface to transfer data to the block and obtain results from the block. All connections (input and output parameters) that the user can access with his project engineering tools are presented in the table. Connections that can only be accessed by the block algorithm (so-called "internal tags") are not shown. The meaning of the columns is as follows:

Column	Meaning/Range of Values
Parameter	Name of connection derived from the English designation. Outputs start with Q...
Meaning	Function and, if necessary, a brief description
Type	S7 parameter data type (BOOL, REAL, DINT, INT, etc.)
Default	Value of parameter prior to the initial block run (unless changed during project engineering)
Input or Output	Type of block algorithm access to parameter - inputs (I), non-interacting inputs (IO), and outputs (O) are differentiated: I: Input parameter, parameter assignment for block, shown left of the block in CFC O: Output parameter, output value, shown right of the block in CFC IO: Input and output parameter, non-interacting input that can be written by the OS and written back from the block, shown left of the block in CFC
Attr.(Attribute)	Additional parameter features for use in CFC. Non-interconnected input parameters and Input/Output parameters can be assigned parameters (input/output parameters only in the case of FCs online). Output parameters cannot be assigned parameters and can be transferred in the CFC by interconnection to an input of the same data type. Additional or alternative parameter properties are indicated as follows: Q: Interconnectable, connection can be interconnected to another connection of the same type U: This parameter is invisible in the CFC. The connection is not shown in the CFC (for example, message ID/event ID) because it is supplied by this block. This parameter is preset in the CFC and can be changed. V: This parameter is visible in the CFC.

Column	Meaning/Range of Values
Operator control &monitoring	The connections labeled with a plus sign (+) have received the Attribute. for operator control and monitoring (s7_m_c = true). These enable operator control and monitoring by means of suitable OS blocks. Operator control and monitoring is not possible for connections labeled with a minus sign (-).
Permitted values	Additional limitation of the range of data type values. If a limitation is not specified, the full data type value range applies.

Feedback Value QRET_VAL

For blocks with an extensive range of return values, a separate table listing the values and their meaning has been added.

Configuration

To conclude, the primary steps required to use the block are enumerated. A note is included, when necessary.

5.3 User Interface

5.3.1 Overview

With regard to the element names applied from the S7 project, note also the information about Chart-in-Chart technology.

The Route Control interface blocks named RC_IF_... include the following:

- Blocks for activating a route

RC_IF_ROUTE (FB800)

RC_IF_DECODER (FC801)

RC_IF_ENCODER (FC800)

- Blocks for interfacing of control elements (CE)

RC_IF_VAL_MOT (FB825)

RC_IF_VALVE (FB826)

RC_IF_MOTOR (FB822)

RC_IF_MOT_REV (FB823)

RC_IF_MOT_SPED (FB824)

RC_IF_USER_CE (FB829)

Note

The RC_IF_USER_CE block can be used to develop user-defined block types. See Example for User-Defined Type

- Blocks for interfacing of sensor elements (SE)

RC_IF_CONDUCT (FB846)

RC_IF_SENSOR (FB845)

RC_IF_USER_SE (FB848)

Note

The RC_IF_USER_SE block can be used to develop user-defined block types. See Example for User-Defined Type

- Blocks for interfacing of parameter elements (PE)

RC_IF_VOLUME (FC808)

RC_IF_TIMER (FC809)

RC_IF_USER_PE (FC807)

Note

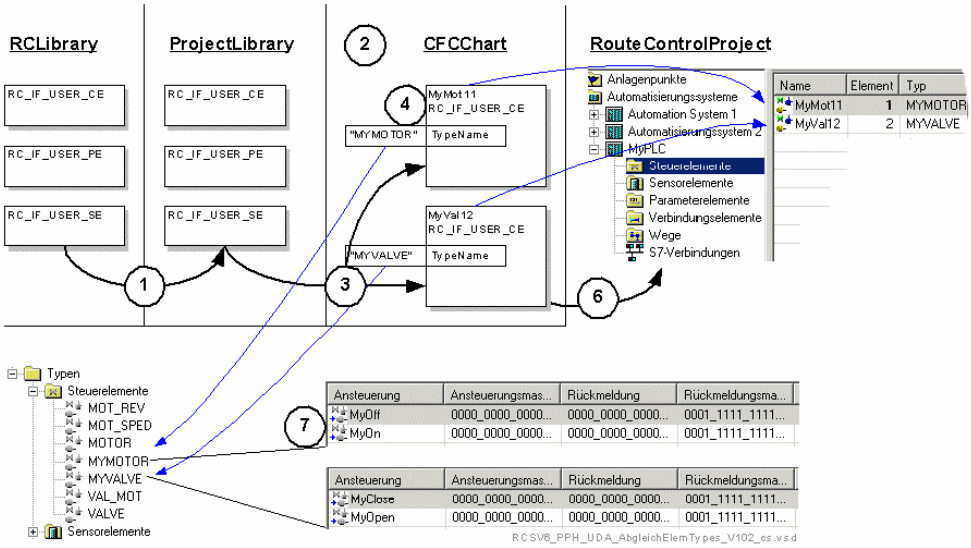
The RC_IF_USER_PE block can be used to develop user-defined block types. See Example for User-Defined Type

- Blocks for interfacing of linking elements (LE)

RC_IF_LE (FB828)

5.3.2 Example of User-Defined Type

Overview



Description

The following procedure is valid for:

- Control elements (CE) - RC_IF_USER_CE (FB829)
- Parameter elements (PE) - RC_IF_USER_PE (FC807)
- Sensor elements (SE) - RC_IF_USER_SE (FB848)

1. Copy the sample block
2. Copy the sample block RC_IF_USER_CE (PE, SE) provided in the Route Control library to your S7 project.
3. Create CFC chart

Create a new CFC chart for inserting the user element blocks.

4. Insert in CFC

Insert the block in the CFC chart and assign a name to the element (MyMot11 and MyVal12 in the example above)

5. Define element type
6. Change the value of input "TypeName" on RC_IF_USER_CE block instance, e.g., to "MYMOTOR" or "MYVALVE".
7. Interconnect element

Interconnect this interface block with the corresponding element from the standard library, e.g., VALVE or MOTOR.

8. Export to Route Control
9. Call the Route Control Wizard and export the new block instance to the Route Control project engineering. The wizard will export the instance name of the block as an element name and the value of the "TypeName" input as an element type.
10. Configure control commands and return values
11. In the Route Control project, fill in the control commands and return values and masks for the newly imported types (MyOff, MyOn, MyOpen, and MyClose in the example).
12. Now you can use the new element with these control commands in partial routes.
13. Update modified Route Control project engineering

Load the Route Control project engineering for the Route Control server and activate the changes via the Route Control Center.

14. Compile CFC chart
15. Compile the CFC chart.
16. Load to automation system

Load the compiled blocks to the automation system.

17. Additional steps

For the manual mode test, request a route that uses this element.

5.4 Configuration

5.4.1 RC_IF_CFG (FB850)

Description

This function block is inserted and its parameters are assigned centrally in an (RC configuration) CFC chart once for each automation system. It assumes the parameters of the automation systems and the Route Control servers. It also brings the Route Control system, that is, the Route Control system blocks, into the call hierarchy of the automation system. The underlying blocks of the Route Control system are called in the automation system from this block.

The block is called in organization blocks OB1 and OB35, restart OBs 100, 101, and 102, and error OBs 121 and 122 of the respective AS.

Note

The user assigns parameters in the inputs (OB_KOMM, OB_SYS, OB_XC) to specify which portion of the Route Control blocks will be processed in which OB. If processing is to take place in OB30, OB31, OB32, OB33, or OB34, the FB850 must be inserted into the corresponding runtime group.

In this block, the RC wizard also automatically enters and configures the local communication IDs for the cross-coupling connections to peer automation systems.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
RC_AS_ID	Number of the Route Control AS (property of the AS)	INT	1	I	U	-	For range, see Valid AS Numbers
OB_COMM	Indicates OB in which communication with RC server is taking place	INT	35	I	V	-	1, 31, 32, 33, 34, 35 See note above
OB_SYS	Indicates OB in which the list of elements for a route is being processed	INT	1	I	V	-	1, 30, 31, 32, 33 See note above
OB_XC	Indicates OB in which AS-AS communication (cross-coupling) is being processed.	INT	1	I	V	-	1, 30, 31, 32, 33, 34, 35 See note above

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
NoRoutes	Maximum number of routes used in this Route Control project 1 to 299: If the number is less than 300, the Route Control internal processing is optimized with respect to time because not all of the routes, and thus not all of the IDs, are being processed. Value must be greater than or equal to the maximum number of simultaneous routes!	INT	300	I	V	-	1 to 300
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	U	-	-
EV_ID2	Event ID for alarm instance #2	DWORD	-	I	U	-	-
CE_SIMU	Indicates whether processing or feedback values from the control elements are to be simulated in this AS:	BOOL	-	I	VQ	+	0: No simulation, the actual return values from the process are used. 1: Simulation of return values, for example, during commissioning
SE_SIMU	Indicates whether processing or feedback values from the sensor elements are to be simulated in this AS:	BOOL	-	I	VQ	+	0: No simulation, the actual return values from the process are used. 1: Simulation of return values, for example, during commissioning
AS_ID_01	Route Control AS ID for connection #1	INT	0	I	V	-	Valid AS Numbers
ASConn01	Local communication ID from NETPRO for connection #1	WORD	W#16#0	I	V	-	-
AltCon01	Alternate connection for AS_ID_01	WORD	W#16#0	I	V	-	-
...	...	...	...	...	...	...	...
AS_ID_32	Route Control AS ID for connection #32	INT	0	I	V	-	-
ASConn32	Local communication ID from NETPRO for connection #32	WORD	W#16#0	I	V	-	-
AltCon32	Alternate connection for AS_ID_32	WORD	W#16#0	I	V	-	-

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
Red_Bus	Indicates whether a redundant AS bus is available.	BOOL	FALSE	I	VQ	-	1: Redundant AS bus available 0: No redundant AS bus available
IDServer	Diagnostic information: Local NETPRO ID of the Route Control server currently acting as master server. This number changes during redundant server failover.	WORD	-	I	VQ	-	0: The Route Control master server has not been restarted since the last download of blocks to the AS <>0: NetPro ID downloaded from the Route Control master server
IDStandby	Diagnostic information: Local NetPro ID of the Route Control server currently acting as standby server This number changes during redundant server failover.	WORD	-	I	V	-	0: The Route Control standby server has not been restarted since the last download of blocks to the AS <>0: NetPro ID downloaded from the Route Control standby server
Q_AS_ID	ID of local automation system; the input ID is assigned by the RC wizard and provided by the block for diagnostics in this instance.	INT	-	O	VQ	-	See Valid AS Numbers
QERR	Indicates whether or not an error has occurred	BOOL	-	O	VQ	-	0: No error (false) 1: Error in route block (true)

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QRET_VAL	Diagnostic information of block (hexadecimal)	WORD	-	O	VQ	-	8501: AS ID is invalid (outside permitted range) 8503: RC_IF_CFG is not running in the OB specified by means of OB_KOMM. 8504: RC_IF_CFG is not running in the OB specified by means of OB_SYS. 8505: RC_IF_CFG is not running in the OB specified by means of OB_XC. In the case of 8xxx values, check the input parameters or the call environment of the OB
IniServ1	Diagnostic information: Result of initialization of communication to the Route Control master server	BOOL	-	O	VQ	-	1: Initialization of communication failed 0: Initialization was successful
IniServ2	Diagnostic information: Result of initialization of communication to the Route Control standby server	BOOL	-	O	VQ	-	1: Initialization of communication failed 0: Initialization was successful
ComServ1	Diagnostic information: Communication error during connection to Route Control master server	BOOL	-	O	VQ	-	0: OK 1: Error
ComServ2	Diagnostic information: Communication error during connection to Route Control standby server	BOOL	-	O	VQ	-	0: OK 1: Error

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ConnAS01	Connection status to peer AS #1	BYTE	-	O	VQ	+	0: Communication or connection error 1: OK, connected to remote AS 2: Local AS 3: Not used
...	...	...	...	...	...	...	...
ConnAS32	Connection status to peer AS #32	BYTE	-	O	VQ	+	See ConnAS01
XC_CfgErr	Return value diagnostic information in the event of a cross-coupling configuration error	INT	-	O	VQ	-	0: No configuration error detected -1: ID for this AS is invalid (=0) -2: ID for this AS is not included in the configuration table of AS_ID_XX inputs -10: No access to data record in XC_PCU data block. Check "RC_XC_PCU". max; this parameter must contain the number of data records
DiaASID	Diagnostic value of cross-coupling: Route Control AS ID (Note: Diagnostic selection is made by means of DiaConIndx input)	INT	-	O	VQ	-	-
DiaDSNo	Diagnostic value of cross-coupling: Calculated data record in cross-coupling data block (RC_XC_PCU) Note: Normally, this data record number is identical to the connection number (ASConxx) For additional information, connect this output to the RC_IF_XC_DIAG block	INT	-	O	VQ	-	-1: No data record index, because local AS is involved 1..31 data record number

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
DiaErr	Diagnostic value of cross-coupling: Error value in cross-coupling data block (RC_XC_PCU) (Note: Diagnostic selection is made by means of DiaConIndx input)	INT	-	O	VQ	-	-1: Instance data block for cross-coupling is missing -2: Incorrect instance data block number in the data record for cross-coupling (XC_PCU) -3: The ID of the remote AS is invalid (ID <= 0!) -4: The ID of the remote AS is identical to the ID of the local AS -> System cannot find remote AS -5: The ID of the remote AS occurs multiple times in the data records for cross-coupling
DiaState	Diagnostic value of cross-coupling: Status of peer AS (Note: Diagnostic selection is made by means of DiaConIndx input)	INT	-	O	VQ	-	0: Peer is in STOP mode 2: Peer-AS is in RUN status, that is, OK, no error -1: Error For additional values, see LOCAL output of SFB STATUS (SFB22)
DiaConn1	Diagnostic value of cross-coupling: Status of connection to RC server #1	INT	-	O	VQ	-	-1: Connection error 2: OK, no error
DiaConn2	Diagnostic value of cross-coupling: Status of second connection to partner AS (Note: Diagnostic selection is made by means of DiaConIndx input)	INT	-	O	VQ	-	-1: Connection error 2: OK, no error For additional values, see STATUS output of SFB STATUS (SFB 22)

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
DiagParam	Diagnostic value of cross-coupling: Note: Diagnostic selection is made by means of DiaConIndx index	BOOL	-	O	UQ	-	0: No error 1: Peer AS did not acknowledge the most recent PUT job
QSERV_IP	IP address of currently active RC server. The active RC server is the one that processes route requests.	DWORD	-	O	VQ	-	IP address of the server in hexadecimal format Theoretically 0.0.0.0 to 255.255.255.255
DiaConIndx	Index for selection of peer AS for display of detailed cross-coupling diagnostics	INT	0	IO	V	-	1 to 32
Q_OOS *	AS in "Maintenance" status for Route Control	BOOL	-	O	V	-	0: AS "Produktion" status 1: AS "Maintenance" status
QPENDOOS *	Pending request for "Maintenance" (sent from RC Center via RC server).	BOOL	-	O	V	-	0: Pending request for "Production". 1: Pending request for "Maintenance".

* new in RC V6.1

Feedback Value QRET_VAL

Value	Meaning
8501 (hex)	Parameter RC_AS_ID is outside of the valid range, see Valid AS Numbers
8503	Server communication is not being processed FB850 is not being processed in the OB specified at input OB_KOMM. Change the value at the input and check the position of the FB850
8504	The element list of a route is not being processed. FB850 is not being processed in the OB specified at input OB_SYS. Change the value at the input and check the position of the FB850
8505	The cross-coupling is not being processed. FB850 is not being processed in the OB specified at input OB_XC. Change the value at the input and check the position of the FB850

Configuration

1. Create a new CFC chart in an AS or copy the sample chart from the Route Control library to your project.
2. Set parameters for input RC_AS_ID. For the valid value range, refer to Valid AS Numbers.
3. Start the Route Control Wizard and allow the local communication IDs for the AS-AS connections (cross-coupling) to the peer automation systems be entered automatically. For activation of this step, note also the RC wizard dialog in Route Control Wizard: Actions.

Note

Because the SFB PUT stores the connection ID passed during the initial call, an AS restart is mandatory each time the connection ID is changed (inputs ASConn01 to ASConn32 or AltCon01 to AltCon32)! If the automation system is not restarted, the SFB PUT will continue to use the old connection ID to send and, as a result, it might send to the wrong peer AS.

5.5 Routes

5.5.1 RC_IF_ROUTE (FB800)

Description

The RC_IF_ROUTE block is the **central interface of a route** to the user program and the counterpart to the RC faceplate in the WinCC picture. The following occurs on this block:

- Route parameters (source, destination, via, mod, material, etc.) are specified
- Material transports are started, held, and stopped
- Setpoints for monitoring times (status monitoring time, fault tolerance time) are defined
- Dynamic setpoints for external parameter elements are specified
- Batch ID, batch name, and step number from a BATCH system are transferred

From the user perspective, the block controls exactly one route (that is, exactly one material transport) and returns information on the status of the route and the route elements to the user program by means of output parameters.

Typically, your own SFC derived from RC_IF_ROUTE_SFC and an RC_IF_ENCODER (FC800) will be upstream of RC_IF_ROUTE and an RC_IF_DECODER (FC801) will be downstream of RC_IF_ROUTE.

For an overview of how the SFC, route, and control dialogs are interrelated, refer to Guide: Interrelationship of SFC and Route Including Control Dialogs.

Dynamic or Fixed Route ID

A route can be operated with a fixed route ID - refer to Valid Route ID. If the Route_ID input contains a 0 (that is, a route ID is not configured in this block), the next available route ID will be determined during runtime when the route is started (that is, a route is requested), and the route will be operated initially using this ID. Dynamic route IDs are then used if the number of routes in the plant could exceed 300, but provision has been made for no more than 300 material transports to take place simultaneously. The concept of dynamic ID assignment facilitates project engineering and avoids errors resulting from duplicate ID assignments.

Organization Blocks (OB)

In general, the RC_IF_ROUTE block can be inserted in any OB. However, the only useful OBs are the time blocks OB30 to OB35, or OB1.

Note

In smaller plants (up to 30 material transports), the RC_IF_ROUTE can be inserted in the available OB1 cycle or the OB with a cycle time of 200 ms or 400 ms.

The following applies generally: processing speed of RC_IF_ROUTE should not exceed that of the kernel blocks of Route Control. The processing time of the kernel blocks can be read in the OB1 cycle.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ROUTE_ID	Unique ID across all automation systems and thus unique from all others in the project of the routing system	INT	0	I	V	-	0:The dynamic ID assignment concept is being used. >0: A fixed ID is entered and used for all material transports with this block See also FIXED_ID input
FIXED_ID	Indicates whether the created ID is to be retained as a fixed ID:	BOOL	FALSE	I	VQ	+	0: Dynamic ID assignment 1: Fixed ID assignment
RES_MAN	When the route is controlled manually, i. e. via the Route Control Center, the user program can use this signal to return the route to automatic mode	BOOL	FALSE	I	VQ	+	0 -> 1: Positive resets to automatic mode. 1 -> 0: Not evaluated
FUNC_ID	Function ID of route; this is important for the route request	INT	-	I	VQ	+	0:System assigns route IDs as function ID FUNC_ID = QID 1..300: Assigned by system 300..32.000: User see Valid Function Identification

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
MON_TM	Alternate value for the system monitoring time: Monitoring time, in seconds Maximum permissible time for all elements to have assumed the set position once a mode level is activated. See also MON_TM1 to MON_TM32 inputs	INT	30	I	VQ	+	1 to n
FLT_TM	Alternate value for fault tolerance time: Monitoring time, in seconds Maximum permissible time for an element to assume the set position again after it has reached the set position once and left it. See also FLT_TM1 to FLT_TM32 inputs	INT	10	I	VQ	+	1 to n
MON_TM1	Monitoring time for mode level #1 -1: Alternate value MON_TM will be used >0: Time, in seconds	INT	-1	I	UQ	-	1 to n
...	...	...	...	...	...	...	...
MON_TM32	Monitoring time for mode level #32 -1: Alternate value MON_TM will be used >0: Time, in seconds	INT	-1	I	UQ	-	1 to n
FLT_TM1	Fault tolerance time for mode level #1 -1: Alternate value FLT_TM will be used >0: Time, in seconds	INT	-1	I	UQ	-	1 to n
...	...	...	...	...	...	...	...
FLT_TM32	Fault tolerance time for mode level #32 -1: Alternate value FLT_TM will be used >0: Time, in seconds	INT	-1	I	UQ	-	1 to n
Mode	Mode levels to be activated. This 32-bit value is an OR operation of 32 bit signals whereby each binary signal stands for one mode level.	DWORD	-	I	VQ	+	1 to 2 to the power of 32 -1

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
SOURCE	Starting point for a route (source of material transport) :	DINT	L#0	I	VQ	+	0: Not permitted >0: ID of location from Route Control project engineering
VIA_1	Via location #1 for a route	DINT	L#0	I	VQ	+	0: Permitted, but location will be ignored >0: ID of location from Route Control project engineering
...	...	...	...	...	...	...	...
VIA_10	Via location #10 for a route	DINT	L#0	I	VQ	+	0: Permitted, but location will be ignored >0: ID of location from Route Control project engineering
DEST	Destination for a route (destination of material transport)	DINT	L#0	I	VQ	+	0: Not permitted >0: ID of location from Route Control project engineering
MODE_TBL	Mode table Parameters for route request	DINT	-	I	VQ	+	0: All partial routes in all mode tables are searched. >0: Only partial routes that are assigned to the mode catalog in the Route Control project engineering are considered
Material	Material to be transported This parameter only has to be specified if a) Linking elements will be used for visualization b) During the route search, material compatibility relative to the previously transported material will be assessed Otherwise, 0 is applied here	DINT	-	I	VQ	+	0 or 1 to 32,000
MATSTAUT	"Material Set Automatically" For a sequence diagram and description, refer to Material: Sequence Diagram for RC_IF_ROUTE	BOOL	TRUE	I	V*Q	-	0: * Material is not applied automatically 1: * Each time a route switches to the "Active" state, the material in the linking elements is applied.

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
SET_MAT	MATERIAL parameter is set in all linking elements involved in the route. A positive edge sets the material. This function cannot be executed unless the route has a valid route list in all of the automation systems involved. The status of the route must be at least "Ready for start"	BOOL	FALSE	I	VQ	-	0 -> 1: Material is applied 1 -> 0: No evaluation takes place
IGN_ERR	This parameter indicates the route response in the event of a fault:	BOOL	FALSE	I	VQ	+	0: NO = In case of error, the route is held, and the active elements are switched off 1: YES = Error is ignored, and route operation continues Note: The active elements are not switched off;
SOLID	Indicates whether this route involves solid materials: This parameter affects the route search and the interlocking of route elements. In addition, the order of elements in a partial route plays an important role (enabling from destination to source). **This function has not yet been implemented in Route Control V6.0 and is reserved for future use!**	BOOL	FALSE	I	UQ	+	0: Liquid material transport 1:Solid material transport
EN_OS_QU	This parameter indicates the behavior of the route once the user has acknowledged an error message in the display: The "Resume" command must be executed in order to start the route. See also parameter ACK_MAN	BOOL	-	I	VQ	+	1: Route is restarted when message is acknowledged 0: Route remains in error state after message is acknowledged

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
EN_DIA_M	Diagnostic message output in WinCC can be controlled with this parameter.	BOOL	TRUE*	I	VQ	+	1: A message is issued for each RUN / HOLD / TERMINATE of the route 0: No messages are issued
MSG_LOCK	This can be used to generally suppress sending of interrupts/messages for a route:	BOOL	-	I	UQ	+	1: Interrupt messages are suppressed 0: Interrupt messages are not suppressed
EXT_1_I	External setpoint #1 for an external route parameter element. This index will be entered in the PE as a value during project engineering.	REAL	-	I	VQ	-	
...	...	...	...	...	...	...	...
EXT_24_I	External setpoint #24 for an external route parameter element. This index will be entered in the PE as a value during project engineering.	REAL	-	I	VQ	-	
GETXPE	Forces the external setpoints for parameter elements to be transferred again.	BOOL	-	I	UQ	-	
BA_EN	Input for SIMATIC BATCH This parameter will be transferred in the route block and passed through by Route Control to the activated route elements	BOOL	-	I	VQ	+	1: Batch is processed by a batch system 0: Batch is not processed by a batch system
OCCUPIED	Input for SIMATIC BATCH This parameter will be transferred in the route block and passed through by Route Control to the activated route elements	BOOL	-	I	VQ	+	1: Path is occupied by BATCH 0: Path is not occupied by BATCH
BA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the activated elements of a route.	DWORD	-	I	VQ	+	

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
BA_NA	Element is occupied by a batch with this name in BATCH. This name will be transferred in the route block and passed through by Route Control to the activated route elements	STRING [32]	-	I	VQ	+	
STEP_NO	Element is occupied by a step of BATCH with this number. This number will be transferred in the route block and passed through by Route Control to the activated elements of a route.	DWORD	-	I	VQ	+	
EV_ID1	Event ID for interrupt instance #1	DWORD	-	I	UQ	-	
...	...	...	...	...	...	...	...
EV_ID3	Event ID for interrupt instance #3	DWORD	-	I	UQ	-	
I_ID	Instance OD used by the RC server (not interconnected!)	DWORD	-	I	UQ	-	
REQ_TIME	Maximum waiting period for a route request on the RC server. After the waiting period expires, the route goes to error status. See also Valid Maximum Route Request Time	INT	60	I	UQ	-	
MAT_UNDO	Undo the acceptance of the material ID in the linking element.	BOOL	FALSE	I	UQ	-	0 -> 1: Positive edge will be evaluated. 0 -> 1: No evaluation takes place
MT_CK_EN	Check material compatibility	BOOL	TRUE	I	UQ	-	1:New material ID is applied to the linking element without verification with respect to predecessor material 0: New material ID is applied only after successful verification with respect to predecessor material

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ON_MAT_ERR	Behavior of the route when the material is not permitted	BOOL	TRUE	I	UQ	-	0: Material error is ignored, route continues 1: Route goes to error when material error is detected
MAT_TIME	Time limiting of material acceptance (timeout)	INT	15	I	VQ	-	1 to n: seconds
NA_MAT	Material name *	STRING [32]	-	O	VQ	+	Name of the current material
QROUT_DB	Route data block number used by this route	INT	-	O	UQ	-	
QID	ID assigned by the RC wizard and used by this route.	INT	-	O	VQ	+	
QACC_DB	Route data block can be accessed	BOOL	-	O	VQ	-	1: Route data block can be accessed 0: Route data block cannot be accessed; Note: Route is still occupied by another instance of RC_IF_ROUTE.
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	
QRET_VAL	Return value for route	WORD	-	O	VQ	+	See RC_IF_ROUTE.QRET_VAL
QDIAG	Diagnostic information for route	WORD	-	O	VQ	+	See RC_IF_ROUTE.QDIAG
QREQ_STA	Status of route request	WORD	-	O	VQ	+	0: Not active 2: Request is currently running 4: Route request was successful; all element lists of a route have been loaded to all relevant AS 8xxx:: For error information, see RC_IF_ROUTE.QREC_RC
QMAT_DIAG	Return value for check and transfer of materials:	WORD	-	O	VQ	+	See RC_IF_ROUTE.QMAT_DIAG

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QREQ_ERR	Return value for route request	BOOL	-	O	VQ	+	1: Error occurred during route request 0: Route request was successful
QACTIVE	Status of route:	BOOL	-	O	VQ	+	0: Route is not running 1:Route is running or route request is active
QAUTO	AUTOMATIC route control mode	BOOL	-	O	VQ	-	0: Route is controlled manually via the Route Control Center or WinCC faceplate 1: Route is controlled via the user program of the AS (automatic mode)
QMAN	MANUAL route control mode	BOOL	-	O	VQ	+	0: Route is controlled via the user program of the AS (automatic mode) 1: Route is controlled manually via the Route Control Center or WinCC faceplate
QREQ	Diagnostic information on route request	BOOL	-	O	VQ	+	0: Route list is not (yet) valid 1: Route request was successful; all element lists of the route have been loaded to all relevant AS Corresponds to a value of 4 in the QREQ_STA parameter

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QON	Indicates whether or not the status of the route is "active"	BOOL	-	O	VQ	+	0:Route is still in "active" state, modes have not yet been applied; the elements are not activated 1: Route is in "active" state; modes have been applied; Elements will be activated
QHOLD	Indicates whether or not the route has been held	BOOL	-	O	VQ	+	0: Route has not been held 1: Route has been held For the route to continue running, the HOLD input must be reset to 0 or the RESUME button must be activated on the faceplate/RCC
QSTOP	Indicates whether or not the route will be terminated:	BOOL	-	O	VQ	+	0: Route termination is not active 1: STOP input (STOP_AU or STOP_MAN) has been activated; route will be terminated For a new route to be requested, the STOP_AU input must be reset after termination of a route
QACK	Indicates whether or not error reset is active	BOOL	-	O	VQ	+	0: Error reset is not active 1: Error reset is active
QERR	Indicates whether an error has occurred in the route block:	BOOL	-	O	VQ	+	0: No error 1: Group error in route block For more details, refer to return value QRET_VAL
QMON_TOU	Indicates whether the system monitoring time has expired resulting in an error:	BOOL	-	O	VQ	+	0: No error, time has not yet expired 1: Time has expired

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QFLT_TOU	Indicates whether the fault tolerance time has expired resulting in an error:	BOOL	-	O	VQ	+	0: No error, time has not yet expired 1: Time has expired
QMAT_ERR	Indicates whether there is a material error, for example, from a route request:	BOOL	-	O	VQ	+	0: No error 1: Material error; material is not compatible with predecessor material For details, refer to return value QMAT_DIA
QMAT_OK	If outputs QMAT_ERR and QMAT_OK both have a value of 0 (false at the same time), then a material check has not yet been initiated or the material check is currently active	BOOL	-	O	VQ	+	Negative logic of QMAT_ERR
QVALID	Indicates whether or not the static route data such as source and destination locations, function ID, etc. are okay:	BOOL	-	O	VQ	+	1: Values are o.k., and the list of elements is available 0: Error in the static values Route was requested in manual mode with modified route data and then switched back to automatic mode during an active route
QRCC	Diagnostic information: Route will be displayed in the Route Control Center	BOOL	-	O	VQ	+	0: Route Control Center will not display this route 1: Route Control Center will display this route
QMODE_AC	The current actual values of the function IDs are returned as a 32-bit value.	BOOL	-	O	VQ	+	Bit x = 1 mode has been reached/satisfied Bit x = 0 mode has not been reached/satisfied
QRESTPOS	Indicates whether or not *all* of the actively used control elements of a mode level are in the rest position.	DWORD	-	O	VQ	-	Bit x = 1 Rest position reached Bit x = 0 Rest position not achieved

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QRPOSERR	Rest position error for mode level Failure to stay in the rest position causes an error to be signaled if at least one active element is activated from another route or in manual mode. When elements are activated by another route (for example, in another mode level) or by a "concurrent" route (that is, a route with the same FUNC_ID), no error is signaled. Meaning: The block being activated is "aware" that no error has actually occurred.	DWORD	-	O	UQ	-	Bit x = 1 Rest position error satisfied (error is pending) Bit x = 0 No rest position error
QMON_ERR	Indicates whether all elements of a mode level have reached their set position within the fault tolerance time.	DWORD	-	O	UQ	-	Bit x = 1 Set position not reached on time Bit x = 0 All elements have assumed their set position on time
QFLT_ERR	Indicates whether elements of a mode level have failed to stay in their previously achieved set position for longer than the system monitoring time	DWORD	-	O	UQ	-	Bit x = 1 Failure to stay in the final position Bit x = 0 All elements are still in the set position (activated state)
QGRP_ERR	OR operation from the three signals indicated above: - QMON_ERR - QFLT_ERR - QRPOSERR In this way, the user program can determine on the basis of a single signal whether there is an error in the mode level.	DWORD	-	O	UQ	+	

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QMN_TM1	Current value of the system monitoring time for mode level #1 QMN_TM1 = MON_TM1 input: System monitoring time is not running QMN_TM1 = 0; System monitoring time has expired; Mode level #1 is signaling a system monitoring time error All other values: System monitoring time is running	INT	-	O	UQ	-	
...	...	...	...	...	...	...	...
QMN_TM32	Current value #32 of the system monitoring time for mode level #32	INT	-	O	UQ	-	
QFL_TM1	Current value #1 of fault tolerance time for mode level #1 QFL_TM1 = FLT_TM1 input: Fault tolerance time is not running QMN_TM1 = 0; Fault tolerance time has expired; Mode level #1 is signaling a fault tolerance time error All other values: Fault tolerance time is running	INT	.	O	VQ	-	
...	...	...	...	...	...	...	...
QFL_TM32	Current value #32 of fault tolerance time for mode level #32	INT	.	O	VQ	-	
QSTATE	Diagnostic: Route status (FB801) (Status in the data block containing the element list of a route)	INT	-	O	VQ	+	-1: Route is available and inactive 0: Idle; route is waiting for REQ signal 9: Cyclic wait 10: Telegram for route request will be sent

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
							11: Waiting for route list from RC server 12: Route list was received; initializations are being performed 13: Master AS: Wait until all job data have been sent to partner AS. 14: Route can be executed; route is ready-to-start 15: Route has been started; route telegram will be sent to server. 101: Elements will be activated according to the modes 102: Route will be deactivated (route will be held or terminated) 112: Route will be held due to an error 113: Route is deactivated because an error occurred 200: Route will be deactivated due to a cross-coupling receive error; Slave AS is waiting for new command from master AS. (Status 200 is only possible for routes in the slave AS)

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QRCM_STA	Diagnostic status of route (FB800) (Status in instance DB)	INT	-	O	UQ	-	-1: Route is available and inactive 0: Idle; route is waiting for REQ signal 9: Cyclic wait 10: Telegram for route request will be sent 11: Waiting for route list from RC server 12: Route list was received; initializations are being performed 13: Master AS: Wait until all job data have been sent to partner AS. 14: Route can be executed; route is ready-to-start 15: Route has been started; route telegram will be sent to server. 101: Elements will be activated according to the modes 102: Route will be deactivated (route will be held or terminated) 103: Route is deactivated (route is held) 112: Route will be held due to an error 113: Route is deactivated because an error occurred
EXT_1_O	Current return value for external parameter element with Index #1	REAL	-	O	UQ	-	
...	...	...	...	...	...	...	...
EXT_24_O	Current return value for external parameter element with Index #24	REAL	-	O	UQ	-	

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
GETXSTS	Status of actual values of external parameter elements:	BYTE	-	O	UQ	-	0: Invalid values 1: Valid values
GETXDIAG	Diagnostic output:	WORD	-	O	UQ	-	See RC_IF_ROUTE.GETXDIAG
NA_SOURCE	Name of starting position in plain text	STRING [32]	-	O	VQ	+	
NA_DEST	Name of destination location in plain text	STRING [32]	-	O	VQ	+	
NA_VIA1	Via location name #1 in plain text	STRING [32]	-	O	VQ	+	
...	...	...	...	...	...	...	...
NA_VIA10	Via location name #10 in plain text	STRING [32]	-	O	VQ	+	
QDINO	Diagnostics: Number of instance data block using this RC_IF_ROUTE block.	INT	-	O	UQ	-	
QREQ_TIM	Current value for duration of the last route request.	INT	-	O	UQ	+	
QSERV_IP	IP address of the current RC server	DWORD	-	O	UQ	+	
QSP_MODE	Current setpoint value of the mode (MODE)	DWORD	-	O	UQ	+	
REQ_AU	This input will be taken into consideration if the route is in automatic mode. (AUT_MAN input has a value of 0) Interconnectable input for route request activation.	BOOL	-	I O	VQ	+	0: No route request 1:Activate route request Note: Route request will not be executed if the STOP_AU input has a value of 1.
ON_AU	This input will be taken into consideration if the route is in automatic mode. (AUT_MAN input has a value of 0) Interconnectable input for starting the route	BOOL	-	I O	VQ	+	0: Route will not (yet) be started 1: Route has been started Note: The start route operation is not executed if the STOP_AU input has a value of 1.

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
HOLD_AU	This input will be taken into consideration if the route is in automatic mode. (AUT_MAN input has a value of 0) Interconnectable input for holding the route	BOOL	-	I O	VQ	+	0: The route has not (yet) been held 1: Route has been held Note: To resume the route, this input must be reset to 0
ACK_AU	This input will be taken into consideration if the route is in automatic mode. (AUT_MAN input has a value of 0) Interconnectable input for acknowledging route errors	BOOL	-	I O	VQ	+	0: Error will not be acknowledged 1: Error will be acknowledged Note: If the route is in HELD status (due to an error), this input acts to resume the route if the HOLD_AU input has a value of 0 simultaneously.
STOP_AU	This input will be taken into consideration if the route is in automatic mode. (AUT_MAN input has a value of 0) Interconnectable input for stopping the route	BOOL	-	I O	VQ	+	0: Route will not (yet) be stopped 1: Route is stopped Note: This input must be reset to 0 before the next route request
AUT_MAN	Indicates whether the faceplate will be used to control the route: This input is operated by means of the faceplate and cannot be interconnected.	BOOL	-	I O	V	+	0: Control by means of the AS/automatic mode (false) 1: Control by means of the faceplate/RCC (true)
REQ_MAN	This input will be taken into consideration if operator input of the route occurs by means of the faceplate/RCC. (AUT_MAN input has a value of 1) Enabling a route request by means of the faceplate: This input cannot be interconnected	BOOL	-	I O	V	+	0: No route request 1: Route request is activated.

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ON_MAN	This input will be taken into consideration if operator input of the route occurs by means of the faceplate/RCC. (AUT_MAN input has a value of 1) Starting a route by means of the faceplate: This input cannot be interconnected	BOOL	-	I O	V	+	0: Route has not (yet) been started 1: Route is started
HOLD_MAN	This input will be taken into consideration if operator input of the route occurs by means of the faceplate/RCC. (AUT_MAN input has a value of 1) Holding a route by means of the faceplate:	BOOL	-	I O	V	+	0: The route has not (yet) been held 1: Route will be held This input cannot be interconnected
ACK_MAN	This input will be taken into consideration if operator input of the route occurs by means of the faceplate/RCC. (AUT_MAN input has a value of 1) Acknowledgment of route errors by means of the faceplate Note: If the route is in HELD status, this input acts to resume the route This input cannot be interconnected	BOOL	-	I O	V	+	0: Error has not (yet) been acknowledged 1: Error will be acknowledged
STOP_MAN	This input will be taken into consideration if operator input of the route occurs by means of the faceplate/RCC. (AUT_MAN input has a value of 1) Indicates whether the faceplate has stopped the route.	BOOL	-	I O	V	+	0: No (false) 1: Yes, route stopped by means of the faceplate (true)

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
GET_ID	This input will be taken into consideration if operator input of the route occurs by means of the faceplate/RCC. (AUT_MAN input has a value of 1) Indicates whether the faceplate has initiated an ID request	BOOL	-	I O	U	+	0: No (false) 1: Yes, ID has been requested by means of the faceplate (true)

* New / changed in V6.1

Project Engineering

1. Create a new CFC chart, or copy a sample chart created previously into your project
2. If you are using fixed route ID assignment:
   Assign a unique route ID (Valid Route ID), and change the FIXED_ID parameter to 1
3. If you are using dynamic ID assignment, change the FIXED_ID parameter to 0. See also the example in the guide on dynamic ID assignment.
4. Create your user program (FB) for activating the route block, or use a copy of the sample SFC and place the block in the same CFC chart.
5. Interconnect the control inputs XXX_AU and MODE to the user program.
6. Assign the route parameters (IDs of locations, time setpoints, function IDs, mode tables), or interconnect these inputs to your user program.
7. Interconnect any other inputs (for material management, external parameter elements)
8. Interconnect the outputs of the RC_IF_ROUTE to the upstream user program
9. Start the RC wizard and export the route ID for the RC engineering project; instances of the RC_IF_ROUTE block are displayed there under 'Routes'
10. Start the Route Control Wizard, and compile the Route Control server messages for this route in your WinCC project.
    Note: This item must be repeated after a general reset of the WinCC project

Example

SFC: Overview

5.5.2 RC_IF_ROUTE.QREC_STA

Meaning of Parameter

This parameter provides information on the status of a route request.

Return Values of Parameter

QREC_STA	Meaning
0000	Internal status is IDLE
0002	A route request is currently active
0004	Route list received; route request was successful
0010	Details on route request: Sending batch data to server
0020	Details on route request: Waiting for receipt of new route list
8000	Transmission error
8001	Route Control server has not responded within the request monitoring time. The route list and/or the TransOK flag (indicating enabling by the server) does not exist.
8002	No route was found in the server
8003	Control elements and/or partial routes of the located route is already being used by another route and no other alternative route could be found. Solution: Request the route again at a later time when the resources have been released by the other route, or expand the route network to include other alternative routes.
8004	One or more of the specified source, via, and/or destination locations are zero (0)
8005	Error in the route list received: The number of elements and/or the length of a data record is incorrect. Cause: Server and AS version (library) do not match. Solution: Install the suitable versions.
8006	No route was found: Elements with incorrect status were discovered during the route search; for example, element is in manual mode, locked (out of service)
8007	No route was found; maximum number of licensed material transports has been reached
8008	Route request cannot be sent to the server
80FF	Material is not permitted as a successor; route search failed

5.5.3 RC_IF_ROUTE.QRET_VAL

QRET_VAL Return Values for a Route (RC_IF_ROUTE)

This output is used by the route to provide error information for evaluation in a user program.

QRET_VAL	Meaning
0	No errors occurred during execution of RC_IF_ROUTE
8000	Route Control server could not send the element lists of the route to all of the automation systems involved. Check the connections between the RC server and all RC automation systems.
8001	Time exceeded when the route list was requested. The Route Control server has not sent the route list or signaled final enabling ("TransOk") of the route from the server perspective in the specified monitoring time (for example, 240 seconds). Check to determine whether the Route Control server is active Check the connection between the Route Control server and the RC AS requesting the route.
8002	No path could be found for the specified source, via, and/or destination locations. Solution: Use other locations or check your project configuration (route network) in the RC engineering tool.
8003	Control elements and/or partial routes of the located route is already being used by another route and no other alternative route could be found. Solution: Request the route again at a later time when the resources have been released by the other route, or expand the route network to include other alternative routes.
8004	One or more of the specified source, via, and/or destination locations are zero (0)
8005	Error in the route list received: The number of elements and/or the length of a data record is incorrect. Cause: Server and AS version (library) do not match. Solution: Install the suitable versions.
8006	No route was found: Elements with incorrect status were discovered during the route search; for example, element is in manual mode, locked (out of service)
8007	No route was found; maximum number of licensed material transports has been reached
8008	Route request cannot be sent to the server
8010	Compilation ID in route list and DB_CFG (DB100) are different. That is, blocks from different Route Control libraries were used.
8013	Status of route list is not defined. Solution: System corrects this error by itself. (Route list goes to IDLE state)
8016	Route request is not possible instance of FB800 is missing in the route list
8022	Monitoring time for receipt of data has expired (Cross-coupling in the peer AS (slave)
8027	Route ID (recognition feature) is incorrect in the receive buffer
8028	Monitoring time for receipt of data has expired (Cross-coupling in the peer AS (slave)
8030	Equipment error for a control or sensor element (CE, SE)
8031	Monitoring time has expired
8032	Fault tolerance time has expired
8033	Monitoring time for the rest position has expired, that is, at least one element has strayed from its rest position for longer than the tolerated time
8034	Data block is missing for the control elements

QRET_VAL	Meaning
8035	Error occurred when the RC_ATTRIB_PTR function block for control elements was called. Solution: Call RC wizard; the wizard checks the IDs for plausibility and scope. Or: Header data for an element data block are not valid
8036	Data block is missing for the control elements
8037	Error occurred when the RC_ATTRIB_PTR function block for sensor elements was called. Solution: Call RC wizard; the wizard checks the IDs for plausibility and scope. Or: Header data for an element data block are not valid
8038	Data block is missing for the parameter elements
8039	Error occurred when the RC_ATTRIB_PTR function block for parameter elements was called. Solution: Call RC wizard; the wizard checks the IDs for plausibility and scope. Or: Header data for an element data block are not valid
803A	Data block is missing for the linking elements
803B	Error occurred when the RC_ATTRIB_PTR function block for linking elements was called. Solution: Call RC wizard; the wizard checks the IDs for plausibility and scope. Or: Header data for an element data block are not valid
8044	Data block is missing for the control elements
8045	Error occurred when the RC_ATTRIB_PTR function block for control elements was called. Solution: Call RC wizard; the wizard checks the IDs for plausibility and scope. Or: Header data for an element data block are not valid
8046	Data block is missing for the control elements
8047	Error occurred when the RC_ATTRIB_PTR function block for sensor elements was called. Solution: Call RC wizard; the wizard checks the IDs for plausibility and scope. Or: Header data for an element data block are not valid
8048	Data block is missing for the parameter elements
8049	Error occurred when the RC_ATTRIB_PTR function block for parameter elements was called. Solution: Call RC wizard; the wizard checks the IDs for plausibility and scope. Or: Header data for an element data block are not valid
8071	Error occurred when the RC_FIFO_INPUT_FC function block was called
80FF	Route containing this material as a succeeding material to the previous material is not permitted. Solution: Issue route request with another material (for example, perform cleaning first) and then request the route with the new material again or use an alternative route (different source/destination).
8582	Active AS: A telegram with an incorrect route ID (receive ID) was received
8583	Monitoring time for receipt of data has expired; Slave AS is not sending
8FF2	Data block is missing for this route (number of data block = 100 + route ID)
8FF3	No available route ID was found. (for dynamic route ID assignment only) Possible reasons: A) All route IDs in this AS are occupied by other instances of RC_IF_ROUTE Solution: Assign other dynamic route IDs to this AS in the Route Control project configuration. B) Route IDs for dynamic ID assignment have not yet been defined in this AS Solution: Assign dynamic route IDs to this AS in the Route Control project configuration. C) Route Control server has not been started since the last download operation to the AS. Solution: Start the Route Control server D) RC_CFG DB (DB100) was downloaded from the S7 project (offline container) to the AS Solution: Start the Route Control server
8FF4	Route ID is outside the permitted range, see also Valid Route ID

QRET_VAL	Meaning
8FF5	A second route containing the same route ID is attempting to occupy a route data block already occupied by another (master) route. Reason: Route ID in one route has been changed online. The Route Control Wizard checks the IDs for uniqueness. Solution: Restart the RC wizard, align the route IDs in the RC engineering project, and download them to the RC server. Then perform a cold restart.
8FF6	The route with this ID is not a master route for this AS. Possible reasons: a) Route Control server has not been started since the last download operation to the AS. Solution: Start the Route Control server b) RC_CFG DB (DB100) was downloaded from the S7 project (offline container) to the AS. Solution: Start the Route Control server c) Route ID in one route has been changed online. Solution: Start Route Control Wizard and align route IDs and download the Route Control project configuration again
8FF7	Static data in the route list are not valid An active route was terminated in manual mode and requested again with modified static data (source, destination, via locations) and then switched back to automatic mode. Solution: Terminate the route in manual mode and request the route again using the original parameters, or in the case of an inactive route, switch from manual mode back to automatic mode.

5.5.4 RC_IF_ROUTE.QMAT_DIAG

Meaning of Parameter

This parameter provides information on the status of the material mode in a route:

- Check of material sequence (result of the Route Control server)
- Storage, that is, transfer of material number to the linking element (AS)

Return Values of Parameter

QMAT_DIAG	Meaning
0000	Internal material mode status is IDLE
0001	Material is currently being checked
0002	Transfer or removal of material ID to or from the linking elements is currently active (or rollback).
0003	Transfer of material ID to the active AS (master) is complete; transfer of the material ID to the passive AS (slave) is still in progress.
8191	Route data block is missing (DB101 to DB400)
8192	Route ID is outside the valid range
8193	Active AS: Watchdog timer for material check by the server
8194	Active AS: Watchdog timer for storing materials in linking elements
8195	Not used
8196	Route is not a master, RC_IF_ROUTE is located in the peer AS (slave)
8197	Active AS: Material ID is outside the permissible range See Valid material IDs
8198	Mode cannot be executed at the present time due to the route status
819F	Command error (ROLLBACK and SETMAT inputs are both 1/true at the same time)
80FF	Material ID is not permitted

5.5.5 RC_IF_ROUTE.GETXDIAG

GETXDIAG Return Values for a Route (RC_IF_ROUTE)

This output is used by the route to provide detailed diagnostic information on an external parameter element for evaluation in a user program.

QDIAG	Meaning
8180	Active automation system: Actual values of external parameter elements are not yet valid -- have not yet been transferred
8181	Active automation system: No slaves with external parameter elements are present. Any parameter elements occurring in this route are in the master AS
8182	Active automation system: Cross-coupling job for external parameter elements cannot be issued
8183	Active automation system: Request (GET_EX_PE parameter) can only be executed when route status is "RUN"
818F	Active automation system: Runtime exceeded when actual values of external parameter elements were updated

5.5.6 RC_IF_ROUTE.QDIAG

QDIAG Return Values for a Route (RC_IF_ROUTE)

This output is used by the route to provide detailed diagnostic information for evaluation in a user program.

QDIAG	Meaning
8061	Active automation system: Error in send buffer when the RC_XC_JOB_USER_IF_FC function block is called; error when cross coupling is called
8062	Active automation system: Cross-coupling send buffer - missing instance data block of FB800 in route list
8063	Active AS: Cross-coupling send buffer - missing information on destination address in the instance data block of FB800
8066	Passive AS: Error when RC_XC_JOB_USER_IF_FC function block is called
8067	Passive AS: Cross-coupling send buffer - missing instance data block of FB800 in route list
8068	Passive AS: Cross-coupling send buffer - missing information on destination address in the instance data block of FB800
8069	Passive AS: Cross-coupling send buffer - No master AS ID in send buffer
8161	Active AS: Cross-coupling buffer - Block 1 cannot be sent
8162	Active AS: Cross-coupling buffer - Block 2 cannot be sent
8163	Active AS: Cross-coupling buffer - Block 3 cannot be sent
8164	Active AS: Cross-coupling buffer - Block 4 cannot be sent

5.5.7 Example Using QRESTPOS and QRPOSERR

This example will answer questions about the behavior of the QRESTPOS and QRPOSERR outputs for all 32 mode levels in certain scenarios. In this example, QRESTPOSx stands for QRESTPOS1 to QRESTPOS32 and QRPOSERRx stands for QRPOSERR1 to QRPOSERR32.

The example is based on one valve that is activated by one or more routes.

Scenario 1 - Activation by One Route in One Activated Mode

One route activates one valve in one Mode 5; the valve will be opened. No other routes or modes are involved.

Mode 5	Activation	Feedback	QRESTPOSx	QRPOSERRx
1	"ON"	"ON"	Goes from 1 to 0	Remains 1

Scenario 2 - Activation by One Route in One Deactivated Mode

One route activates one valve in one Mode 5; however, Mode 5 is deactivated and the valve will therefore be closed. No other routes or modes are involved.

Mode 5	Activation	Feedback	QRESTPOSx	QRPOSERRx
0	"OFF"	"OFF"	Goes from 0 to 1	Remains 1

Scenario 3 - Activation by One Route with Two Modes

One route activates one valve in one Mode 5 and one Mode 6; Mode 5 is deactivated and Mode 6 is activated. Mode 5 causes the valve to close, and Mode 6 causes the valve to open. No other routes are involved.

Mode 5	Activation	Feedback	QRESTPOS5	QRPOSERR5
0	"OFF"	"OFF"	Goes from 0 to 1	Remains 1

Mode 6	Activation	Feedback	QRESTPOS6	QRPOSERR6
1	"ON"	"ON"	Goes from 1 to 0	Remains 1

Scenario 4 - Activation by Two "Concurrent" Routes

One route activates a valve in deactivated Mode 5, while another route with the same FUNC_ID activates the same valve in Mode 6.

Result is the same as in Scenario 3.

Scenario 5 - Activation by Route in Automatic and Manual Mode

Two different routes activate the same valve; it is irrelevant whether the same mode is used. However, the first route activates the valve in manual mode, while the second route activates the valve in automatic mode.

5.5.8 RC_IF_ENCODER (FC800)

Description

The RC_IF_ENCODER block is a peer block to the Guide: CFC Encoder. It converts 32 individual binary signals into a 32-bit output value. Therefore, this block can be connected upstream of RC_IF_ROUTE in order to convert 32 individual signals for the mode levels into the 32-bit MODE value for the RC_IF_ROUTE block.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
M_01	Binary signal representing Bit #1	BOOL	-	I	VQ	-	0: Bit #1 of MODE = 0 in RC_IF_ROUTE: Mode level will be activated 1: Bit #1 of MODE = 1 in RC_IF_ROUTE: Mode level will be deactivated
...	...	...	...	...	...	...	...
M_32	Binary signal representing Bit #32	BOOL	-	I	VQ	-	0: Bit #32 of MODE = 0 in RC_IF_ROUTE: Mode level will be activated 1: Bit #32 of MODE = 1 in RC_IF_ROUTE: Mode level will be deactivated
QMODE	32-bit value as linkage of 32 individual input signals	DWORD	-	O	VQ	-	1 to 2 to the power of 32 -1

Return Values of Block

The RC_IF_ENCODER block does not supply any diagnostic information.

Project Engineering

1. Insert an RC_IF_ROUTE into the CFC chart.
2. Insert an RC_IF_ENCODER upstream of the RC_IF_ROUTE block.
3. Interconnect the QMODE output of the RC_IF_ENCODER to the MODE input of the RC_IF_ROUTE block.
4. Assign the MODE_0ß1 to 32 commands through a user block

See also RC_IF_DECODER (FC801)

Example

See RC_IF_DECODER (FC801)

See Guide: CFC Encoder

5.5.9 RC_IF_DECODER (FC801)

Description

The RC_IF_DECODER block is a peer block to the RC_IF_ENCODER (FC800). It converts a 32-bit input value into 32 individual output values (bits). Therefore, this block can be connected downstream of RC_IF_ROUTE in order to split up the 32-bit outputs of RC_IF_ROUTE into individual values.

- QMODE_AC (Feedback stages #1 to #32 achieved)
- QRESTPOS (Idle positions)
- QRPOSERR (Simulated idle positions)
- QMON_ERR (monitoring time expired for activation and deactivation)
- QFLT_ERR (Status monitoring time expired)
- QGRP_ERR (Group error)

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
Mode	32-bit value to be split up	DWORD	-	I	VQ	-	0 to 2 to the power of 32 -1
QM_01	Binary signal representing Bit #1	BOOL	-	O	VQ	-	0: Bit #1 of MODE = 0 in RC_IF_ROUTE: Mode is not reached 1: Bit #1 of MODE = 1 in RC_IF_ROUTE: Mode is reached
...	...	...	...	...	...	...	...
QM_32	Binary signal representing Bit #32	BOOL	-	O	VQ	-	0: Bit #32 of MODE = 0 in RC_IF_ROUTE: Mode level is not reached 1: Bit #32 of MODE = 1 in RC_IF_ROUTE: Mode is reached

Return Values of Block

The RC_IF_DECODER block does not supply any diagnostic information.

Project Engineering

1. Insert an RC_IF_ROUTE into the CFC chart.
2. Insert an RC_IF_DECODER downstream of the RC_IF_ROUTE block.
3. Interconnect the required output of the RC_IF_ROUTE block to the MODE input of the RC_IF_DECODER.
4. Evaluate the return signals of the RC_IF_DECODER through a user block.

Example

Guide: CFC Decoder

5.5.10 RC_IF_ROUTE: Simulated Idle State

The RC_IF_ROUTE block has an output QRPOSERR, a 32-bit value that provides feedback about the idle state of the elements of mode levels 1 to 32 as QRPOSERR1 to QRPOSERR32.

The bit QRPOSERRx is set (1) when all active control elements in the respective mode level are in idle state and are providing the correct feedback (CLOSED, OPEN).

The bit QRPOSERRx is also set (1) when the element is activated in another mode level of the same route or by a concurrent route (with the same function ID / FUNC_ID).

A simulated idle state is signaled as long as the control element is not activated by its own route and mode level.

5.6 Control Elements

5.6.1 RC_IF_MOT_REV (FB823)

Description

RC_IF_MOT_REV is an interface block between a **bidirectional motor and an OFF state** and the routing system.

The RC_IF_MOT_REV function is interconnected to the MOTOR block (for example, the MOT_REV function block from the PCS 7 standard library) in the CFC and connects its signals to the data record of a control element within the routing system.

If the motor is involved in the route, the motor is activated according to the interconnection in the route (see Route Control project configuration). The motor feedback is evaluated in the route simultaneously.

Similar Blocks

- RC_IF_MOTOR (FB822) (Single direction motor)
- RC_IF_MOT_SPED (FB824) (Single direction, dual-speed motor)

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ID	Element ID that is unique from all others in the AS	INT	-	I	U	+	Assigned automatically by the RC wizard
FB_ON	Motor feedback:	BOOL	-	I	VQ	-	1: Motor is on (ON) 0: Motor is off (OFF)
FB_DIR	Motor feedback regarding direction:	BOOL	-	I	VQ	-	1: Reverse 2: Forward This signal is evaluated only if FB_ON = 1.
MONITOR	Feedback signal monitoring	BOOL	TRUE	I	VQ	+	1: Monitoring of feedback signals is active 0:Feedback signal monitoring is deactivated; feedback is being simulated.

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
MAN_AUT	Status of upstream element	BOOL	-	I	VQ	-	0: Upstream element is in manual mode 1: Upstream element is in automatic mode
LOCK	Specifies whether an upstream element is locked. See LOCK Input on Element Blocks	BOOL	-	I	VQ	-	1: Upstream element is locked and will not be taken into consideration in the next route search 0: Upstream element is not locked and will be taken into consideration in the next route search
ERROR	Indicates whether upstream element is in error state.	BOOL	-	I	VQ	-	1: Upstream element is faulty 0: Upstream element is not faulty
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element is not considered during next route search 0: Element will be taken into consideration in the route search
PEND_OOS	"Pending out of Service" Indicates whether element :non-availability" is in effect, e.g. during maintenance	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search 0: Maintenance is not pending. Element will be taken into consideration in the next route search
EV_ID1	Event ID for interrupt instance #1	DWORD	-	I	UQ	-	
...	...	...	...	...	...	...	...
EV_ID3	Event ID for interrupt instance #3	DWORD	-	I	UQ	-	

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QID	Element ID automatically assigned by the wizard	INT	-	O	VQ	-	
QBA_EN	Indicates whether element can be used within the context of a batch. See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element can be used for batch 0: Element cannot be used
QOCCUPIED	Indicates whether the element is occupied by a batch See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element is occupied by a batch 0: Element is not occupied by a batch
QRET_VAL	Return value of element:	WORD	-	O	VQ	-	0: No error 8231: Incorrect or invalid element ID 8233: Incorrect or unknown element type. Interface block does not correspond to the element type in the Route Control project configuration
QAUTO_ON	Automatic control	BOOL	-	O	VQ	-	1: Automatic control is activated (ON) Motor is activated (will run) 0: Automatic mode is not active (OFF) Motor will be will be switched off/will not run
QAUT_DIR	Motor direction:	BOOL	-	O	VQ	-	1: Motor will run in reverse 0: Motor will run forward
QMAINT	Motor is in maintenance	BOOL	-	O	UQ	+	1: Motor is "in maintenance" 0: Motor is available
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	
QBA_NA	Element is occupied by a batch with this name in BATCH. This name will be transferred in the route block and passed through by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	
QMODE_NO	Mode level of route activating this element	INT	-	O	UQ	-	
QCOMM_ID	Remote element ID	INT	-		UQ	-	
QSIMU	Element in simulation	BOOL	-	O	UQ	-	1: Feedback will be simulated 0: The return value of the upstream element will be transferred

Project Engineering

1. Insert the RC_IF_MOT_REV in a CFC chart
2. Interconnect to a motor block, for example, a motor block from the PCS 7 standard library
3. Start the RC wizard and allow the element ID to be automatically entered.
4. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

Example

Guide: CFC for Bi-Directional Motor

5.6.2 RC_IF_MOT_SPED (FB824)

Description

The RC_IF_MOT_SPED block is an interface block between a **dual-speed motor (fast, slow, and OFF)** and the routing system.

This block is interconnected to a motor block (for example, the "MOT_SPED" FB68 function block from the PCS 7 standard library).

If the motor is involved in the route, the motor is activated according to the interconnection in the route (see Route Control project configuration). The motor feedback is evaluated in the route simultaneously.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ID	Element ID that is unique from all others in the AS	INT	-	I	U	+	Assigned automatically by the RC wizard
FB_ON	Motor feedback:	BOOL	-	I	VQ	-	1: Motor is on (ON) 0: Motor is off (OFF)
FB_SPEED	Return value of motor – speed	BOOL	-	I	VQ	-	1: Motor is running fast (FAST) 0: Motor is running slowly (SLOW)
MONITOR	Monitor feedback	BOOL	TRUE	I	VQ	+	1: Monitoring of feedback signals is active 0:Feedback signal monitoring is deactivated; feedback is being simulated.
AUT_MAN	Control type of upstream element	BOOL	-	I	VQ	-	0: Upstream element is in manual mode 1: Upstream element is in automatic mode
LOCK	Indicates whether element is locked See LOCK Input on Element Blocks	BOOL	-	I	VQ	-	1: Element is locked and will not be considered during route search 0: Element will be considered during route search

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ERROR	Indicates whether upstream element is in error state.	BOOL	-	I	VQ	-	1: Upstream element is faulty 0: Upstream element is not faulty
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element is not considered during next route search 0: Element will be taken into consideration in the route search
PEND_OOS	"Pending out of Service"	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search 0: Maintenance is not pending. Element will be taken into consideration in the next route search
EV_ID1	Event ID for interrupt instance #1	DWORD	-	I	UQ	-	
...	...	...	...	...	...	...	...
EV_ID3	Event ID for interrupt instance #3	DWORD	-	I	UQ	-	
QID	Element ID automatically assigned by the wizard	INT	-	O	VQ	-	
QBA_EN	Indicates whether element can be used within the context of a batch. See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element will be used as part of BATCH 0: Element will not be used as part of BATCH
QOCCUPIED	Indicates whether element is occupied within the context of a batch. See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element is occupied by a batch 0: Element is not occupied by a batch

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QRET_VAL	Return value for block	WORD	-	O	VQ	-	0: No error 8241: Incorrect or invalid element ID 8243: Incorrect or unknown element type. Interface block does not correspond to the element type in the Route Control project configuration
QAUTO_ON	Motor activation	BOOL	-	O	VQ	-	1: Automatic control is activated (ON) Motor is activated (will run) 0: Automatic mode is not active (OFF) Motor will be will be switched off/will not run
QAUT_SPD	Speed	BOOL	-	O	VQ	-	1: Motor will run fast (FAST) 0: Motor will run slowly (SLOW)
QMAINT	Element in maintenance	BOOL	-	O	UQ	+	1: Motor is "in maintenance" 0: Motor is available
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error
QCOMM_ID	Remote element ID	INT	-	O	UQ	-	
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QBA_NA	Element is occupied by a batch with this name in BATCH. This name will be transferred in the route block and passed through by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	
QMODE_NO	Mode level of route activating this element	INT	-	O	UQ	-	
QSIMU	Element in simulation	BOOL	-	O	UQ	-	1: Feedback will be simulated 0: The return value of the upstream element will be transferred

Project Engineering

1. Insert the RC_IF_MOT_SPED in a CFC chart.
2. Insert a MOTOR block in the CFC chart.
3. Interconnect the two blocks.
4. Start the RC wizard and allow the element ID to be automatically entered.
5. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

Example

Guide: CFC for Dual-Speed Motor

5.6.3 RC_IF_VAL_MOT (FB825)

Description

RC_IF_VAL_MOT is the interface block between a motor-actuated valve and the routing system.

The RC_IF_VAL_MOT function is interconnected to the valve block (for example, function block VAL_MOT FB74 of the PCS 7 standard library) in the CFC and connects its signals to a control element data record in the routing system.

If the valve is involved in the route, the valve is activated according to the interconnection in the route (see Route Control project configuration). The valve feedback is evaluated in the route simultaneously.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ID	Element ID that is unique from all others in the AS	INT	-	I	U	+	Assigned automatically by the RC wizard
FB_CLOSE	Return value (actual value) of the process valve indicating its status:	BOOL	-	I	VQ	-	0: Valve is not closed 1: Valve is closed
FB_OPEN	Return value (actual value) of the process valve indicating its status:	BOOL	-	I	VQ	-	0: Valve is not open 1: Valve is open
MONITOR	Feedback signal monitoring	BOOL	TRUE	I	VQ	+	1: Monitoring of feedback signals is active 0:Feedback signal monitoring is deactivated; feedback is being simulated.
MAN_AUT	Status of upstream element	BOOL	-	I	VQ	-	0: Upstream element is in manual mode 1: Upstream element is in automatic mode

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
LOCK	Specifies whether an upstream element is locked. See LOCK Input on Element Blocks	BOOL	-	I	VQ	-	1: Upstream element is locked and will not be taken into consideration in the next route search 0: Upstream element is not locked and will be taken into consideration in the next route search
ERROR	Indicates whether upstream element is in error state.	BOOL	-	I	VQ	-	1: Upstream element is faulty 0: Upstream element is not faulty
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element is not considered during next route search 0: Element will be taken into consideration in the route search
PEND_OOS	"Pending out of Service"	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search 0: Maintenance is not pending. Element will be taken into consideration in the next route search
EV_ID1	Event ID for interrupt instance #1	DWORD	-	I	UQ	-	-
...	...	...	...	...	...	...	...
EV_ID3	Event ID for interrupt instance #3	DWORD	-	I	UQ	-	-
QID	ID assigned by the RC wizard and used by this route.	INT	-	O	VQ	+	-

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QBA_EN	Indicates whether element can be used within the context of a batch. See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element will be used as part of BATCH 0: Element will not be used as part of BATCH
QOCCUPIED	Indicates whether the element is occupied by a batch See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element is occupied by a batch 0: Element is not occupied by a batch
QRET_VAL	Return value for block	WORD	-	O	VQ	-	0: No error 8251: Incorrect or invalid element ID 8253: Incorrect or unknown element type. Interface block does not correspond to the element type in the Route Control project configuration
QAUTO_ON	Specifies if the motor valve has been triggered	BOOL	TRUE	O	VQ	-	0: Automatic OFF 1: Automatic ON
QAUTO_OC	Specifies how the motor valve has been triggered	BOOL	-	O	VQ	-	0: Motor-operated valve will be activated shut (CLOSE) 1: Motor-operated valve will be activated open (OPEN)
QMAINT	Element in maintenance	BOOL	-	O	UQ	+	1: Motor is "in maintenance" 0: Motor is available
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QBA_NA	Element is occupied by a batch with this name in BATCH. This name will be transferred in the route block and passed through by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QMODE_NO	Mode level of route activating this element	INT	-	O	UQ	-	-
QSIMU	Element in simulation	BOOL	-	O	UQ	-	1: Feedback will be simulated 0: The return value of the upstream element will be transferred

Project Engineering

1. Insert the RC_IF_VAL_MOT block in a CFC chart
2. Interconnect the FB_CLOSE and FB_OPEN inputs and the QAUTO_ON and QAUTO_OC outputs to the external motor-operated valve block.
3. Start the RC wizard and allow the element ID to be automatically entered.
4. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

Example

Guide: CFC for Motor-Operated Valve

5.6.4 RC_IF_MOTOR (FB822)

Description

The RC_IF_MOTOR block is the interface block between the MOTOR block and the routing system for a **motor with two states (OFF, ON)**.

This block is interconnected to a MOTOR block (for example the "MOTOR" FB66 function block from the PCS 7 standard library).

If the motor is involved in the route, the motor is activated according to the interconnection in the route (see Route Control project configuration). The motor feedback is evaluated in the route simultaneously.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ID	Element ID that is unique from all others in the AS	INT	-	I	U	+	Assigned automatically by the RC wizard
FB_ON	Motor feedback:	BOOL	-	I	VQ	-	1: Motor is on (ON) 0: Motor is off (OFF)
MONITOR	Feedback signal monitoring	BOOL	TRUE	I	VQ	+	1: Monitoring of feedback signals is active 0:Feedback signal monitoring is deactivated; feedback is being simulated.
AUT_MAN	Automatic or manual control type of upstream element	BOOL	-	I	VQ	-	1: Upstream element is in manual mode 0: Upstream element is in automatic mode
LOCK	Specifies whether an upstream element is locked. See LOCK Input on Element Blocks	BOOL	-	I	VQ	-	1: Upstream element is locked and will not be taken into consideration in the next route search 0: Upstream element is not locked and will be taken into consideration in the next route search

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ERROR	Indicates whether upstream element is in error state.	BOOL	-	I	VQ	-	1: Upstream element is faulty 0: Upstream element is not faulty
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element is not considered during next route search 0: Element will be taken into consideration in the route search
PEND_OOS	"Pending out of Service"	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search 0: Maintenance is not pending. Element will be taken into consideration in the next route search
EV_ID1	Event ID for interrupt instance #1	DWORD	-	I	UQ	-	-
...	...	...	...	...	...	...	...
EV_ID3	Event ID for interrupt instance #3	DWORD	-	I	UQ	-	-
QID	ID assigned by the RC wizard and used by this route.	INT	-	O	VQ	+	-
QBA_EN	Indicates whether element can be used within the context of a batch. See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element will be used as part of BATCH 0: Element will not be used as part of BATCH
QOCCUPIED	Indicates whether the element is occupied by a batch See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element is occupied by a batch 0: Element is not occupied by a batch

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QRET_VAL	Return value for block	WORD	-	O	VQ	-	0: No error 8221: Incorrect or invalid element ID 8223: Incorrect or unknown element type. Interface block does not correspond to the element type in the Route Control project configuration
QAUTO_ON	Motor activation	BOOL	-	O	VQ	-	1: Automatic control is activated (ON) Motor is activated (will run) 0: Automatic mode is not active (OFF) Motor will be will be switched off/will not run
QMAINT	Element in maintenance	BOOL	-	O	UQ	+	1: Motor is "in maintenance" 0: Motor is available
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QBA_NA	Element is occupied by a batch with this name in BATCH. This name will be transferred in the route block and passed through by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QMODE_NO	Mode level of route activating this element	INT	-	O	UQ	-	-
QSIMU	Element in simulation	BOOL	-	O	UQ	-	1: Feedback will be simulated 0: The return value of the upstream element will be transferred

Project Engineering

1. Insert the RC_IF_MOTOR block in a CFC chart.
2. Insert a MOTOR block in the CFC chart.
3. Interconnect the two blocks.
4. Start the RC wizard and allow the element ID to be automatically entered.
5. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

Example

Guide: CFC for Motor with Two States

5.6.5 RC_IF_VALVE (FB826)

Description

RC_IF_VALVE is an interface block between a valve block and the routing system.

The RC_IF_VAL_MOT function is interconnected to the valve block (for example, function block VAL_MOT FB74 of the PCS 7 standard library) in the CFC and connects its signals to a control element data record in the routing system.

If the valve is involved in the route, the valve is activated according to the interconnection in the route (see Route Control project configuration). The valve feedback is evaluated in the route simultaneously.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ID	Element ID that is unique from all others in the AS	INT	-	I	U	+	Assigned automatically by the RC wizard
FB_CLOSE	Return value (actual value) of the process valve indicating its status:	BOOL	-	I	VQ	-	0: Valve is not closed 1: Valve is closed
FB_OPEN	Return value (actual value) of the process valve indicating its status:	BOOL	-	I	VQ	-	0: Valve is not open 1: Valve is open
MONITOR	Feedback signal monitoring	BOOL	TRUE	I	VQ	+	1: Monitoring of feedback signals is active 0:Feedback signal monitoring is deactivated; feedback is being simulated.
MAN_AUT	Status of upstream element	BOOL	-	I	VQ	-	0: Upstream element is in manual mode 1: Upstream element is in automatic mode

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
LOCK	Specifies whether an upstream element is locked. See LOCK Input on Element Blocks	BOOL	-	I	VQ	-	1: Upstream element is locked and will not be taken into consideration in the next route search 0: Upstream element is not locked and will be taken into consideration in the next route search
ERROR	Indicates whether upstream element is in error state.	BOOL	-	I	VQ	-	1: Upstream element is faulty 0: Upstream element is not faulty
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element is not considered during next route search 0: Element will be taken into consideration in the route search
PEND_OOS	"Pending out of Service"	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search 0: Maintenance is not pending. Element will be taken into consideration in the next route search
EV_ID1	Event ID for interrupt instance #1	DWORD	-	I	UQ	-	-
...	...	...	...	...	...	...	...
EV_ID3	Event ID for interrupt instance #3	DWORD	-	I	UQ	-	-
QID	ID assigned by the RC wizard and used by this route.	INT	-	O	VQ	+	-

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QBA_EN	Indicates whether element can be used within the context of a batch. See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element will be used as part of BATCH 0: Element will not be used as part of BATCH
QOCCUPIED	Indicates whether the element is occupied by a batch See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element is occupied by a batch 0: Element is not occupied by a batch
QRET_VAL	Return value for block	WORD	-	O	VQ	-	Return value of element: 0: No error 8261: Incorrect or invalid element ID 8263: Incorrect or unknown element type. Interface block does not correspond to the element type in the Route Control project configuration
QAUTO_OC	Indicates how the valve is activated:	BOOL	-	O	VQ	-	0: Valve will be activated shut (CLOSE) 1: Valve will be activated open (OPEN)
QMAINT	Element in maintenance	BOOL	-	O	UQ	+	1: Valve is "in maintenance" 0: Valve is available
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QBA_NA	Element is occupied by a batch with this name in BATCH. This name will be transferred in the route block and passed through by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QMODE_NO	Mode level of route activating this element	INT	-	O	UQ	-	-
QSIMU	Element in simulation	BOOL	-	O	UQ	-	1: Feedback will be simulated 0: The return value of the upstream element will be transferred

Project Engineering

1. Insert the RC_IF_VALVE block in a CFC chart.
2. Interconnect the FB_CLOSE and FB_OPEN inputs and the QAUTO_OC output with the valve block
3. Start the RC wizard and allow the element ID to be automatically entered.
4. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

Example

Guide: CFC for Valve with Feedback

Guide: CFC for Valve with Interlocking Module

Guide: CFC for Valve with Two Feedback Signals

Guide: CFC for Valve without a Feedback Signal

5.6.6 RC_IF_USER_CE (FB829)

Description

The RC_IF_USER_CE block provides an interface with user-definable controls and feedback for creating user-defined control elements. It can be interconnected with any process-related block.

If the control element is involved in the route, the element is activated according to the interconnection in the route (see Route Control project configuration). Feedback of the element in the route will be evaluated at the same time.

Note

The RC_IF_USER_CE block does not contain feedback simulation. If required, you can implement feedback simulation by appropriately interconnecting the control outputs with the feedback inputs in the CFC chart. (In the simplest case, by looping back the controls to the corresponding feedback).

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ID	Unique element ID within the automation system	INT	-	I	U	+	Assigned automatically by the RC wizard
ACTIVE	Idle state feedback	BOOL	-	I	VQ	-	1: Element is active, i.e., no longer in idle state 0: Element is not active, i.e., has reached idle state
FB_00	Bit 0 for element feedback see Feedback Bit Assignment	BOOL	-	I	VQ	-	0, 1
...	...	...	...	...	...	...	...
FB_12	Bit 12 for element feedback see Feedback Bit Assignment	BOOL	-	I	VQ	-	0, 1
MAN_AUT	Automatic or manual control type of upstream element	BOOL	-	I	VQ	-	0: Upstream element is in manual mode 1: Upstream element is in automatic mode

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
LOCK	Specifies whether an upstream element is locked. See LOCK Input on Element Blocks	BOOL	-	I	VQ	-	1: Upstream element is locked and will not be taken into consideration in the next route search 0: Upstream element is not locked and will be taken into consideration in the next route search
ERROR	Indicates whether upstream element is in error state.	BOOL	-	I	VQ	-	1: Upstream element is faulty 0: Upstream element is not faulty
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element is not considered during next route search 0: Element will be taken into consideration in the route search
PEND_OOS	"Pending out of Service"	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search 0: Maintenance is not pending. Element will be taken into consideration in the next route search
EV_ID1	Event ID for interrupt instance #1	DWORD	-	I	UQ	-	-
...	...	...	...	...	...	...	...
EV_ID3	Event ID for interrupt instance #3	DWORD	-	I	UQ	-	-
TypeName	Name for control element type	STRING [24]	„MY_CE"	I	V	-	Any character string up to 24 characters
QRET_VAL	Return value for block	WORD	-	O	VQ	-	0: No error 8229: Incorrect or invalid element ID

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error
QID	ID assigned by the RC wizard and used by this element.	INT	-	O	VQ	+	-
Q_C_00	Bit 0 for element control see Control Bit Assignment	BOOL	-	O	VQ	-	1: Control is activated. Element is controlled 0: Control is not active
...	...	...	...	...	...	...	...
Q_C_15	Bit 15 for element control see Control Bit Assignment	BOOL	-	O	VQ	-	1: Control is activated. Element is controlled 0: Control is not active
QBA_EN	Indicates whether element can be used within the context of a batch. See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element will be used as part of BATCH 0: Element will not be used as part of BATCH
QOCCUPIED	Indicates whether the element is occupied by a batch See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element is occupied by a batch 0: Element is not occupied by a batch
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QBA_NA	Element is occupied by a batch with this name in BATCH. This name will be transferred in the route block and passed through by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QMODE_NO	Mode level of route activating this element	INT	-	O	UQ	-	-
QMAINT	Element in maintenance	BOOL	-	O	UQ	+	1: Motor is "in maintenance" 0: Motor is available

Project Engineering

1. Insert RC_IF_USER_CE in a CFC chart
2. Edit the "TypeName" input. Change the name of the subtype of "MY_CE" to a name of your choosing.
3. Interconnect your user-defined block with another block, e.g., a block from the PCS 7 standard library, a block from the SC library, or the PTE library.
4. Start the RC wizard and allow the element ID to be automatically entered.
5. Apply the element ID and the new subtype by importing S7 into the Route Control project engineering.

Note

In order to activate this control element in routes, you still have to create relevant commands on the subtype in the Route Control project engineering tool and edit the control and feedback masks in accordance with the assignment of the control and feedback inputs on the block.

Example

See Example for User-Defined Type

5.6.7 Control Bit Assignment

Assigning Control Bits on the Control Mask Block in the Route Control Engineering Tool

Output Q_C_00 of the block corresponds to bit 0, i.e., the least-significant bit on the right in the control mask; output Q_C_01 corresponds to bit 1, etc.; accordingly, output Q_C_15 corresponds to bit 15 (i. e. the most significant bit, on the left).

5.6.8 Feedback Bit Assignment

Assigning Feedback Bits on the Feedback Mask Block in the Route Control Engineering Tool

Input FB_00 of the block corresponds to bit 0, i. e. the least-significant bit on the right in the feedback mask; input FB_01 corresponds to bit 1, etc.; accordingly, input FB_12 corresponds to bit 12.

Note: Bits 13 to 15 in the feedback mask are already occupied by Route Control, and are therefore not available for user-defined feedback.

5.7 Sensor Elements

5.7.1 RC_IF_SENSOR (FB845)

Description

RC_IF_SENSOR is an interface block between a process sensor and the routing system.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ID	Element ID that is unique from all others in the AS	INT	-	I	U	+	Assigned automatically by the RC wizard
FB_00	Return value of the actual value of a sensor process:	BOOL	-	I	VQ	-	1: Upstream sensor returns 1=TRUE 0: Upstream sensor returns 0=FALSE
ERROR	Indicates whether upstream element is in error state.	BOOL	-	I	VQ	-	1: Upstream element is faulty 0: Upstream element is not faulty
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element is not considered during next route search 0: Element will be taken into consideration in the route search
EV_ID1	Event ID for interrupt instance #1	DWORD	-	I	UQ	-	-
EV_ID2	Event ID for interrupt instance #2	DWORD	-	I	UQ	-	-
QID	ID assigned by the RC wizard and used by this route.	INT	-	O	VQ	+	-

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QRET_VAL	Return value for block	WORD	-	O	VQ	-	0: No error 8451: Incorrect or invalid element ID 8453: Incorrect or unknown element type. Interface block does not correspond to the element type in the Route Control project configuration
QFB_00	Return value (actual value) of sensor; passed through for checking.	BOOL	-	O	VQ	-	Input FB_00 is passed through
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-

Project Engineering

1. Insert the RC_IF_SENSOR block in a CFC chart.
2. Interconnect the FB_00 inputs, ERROR with external sensor
3. Start the RC wizard and allow the element ID to be automatically entered.
4. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

Example

Guideline: CFC for Sensor Element

5.7.2 RC_IF_CONDUCT (FB846)

Description

RC_IF_CONDUCT is an interface block that is located between an analog sensor and the routing system and that maps a real value onto four discrete increments.

If the sensor is involved in the route, the feedback is evaluated according to the interconnection in the route (see Route Control project configuration).

This block behaves similarly to the RC_IF_SENSOR (FB845) block, but RC_IF_SENSOR only recognizes a binary evaluation (value reached? yes/no; for example, damper open/closed). By contrast, RC_IF_CONDUCT recognizes four discrete states and can therefore be used, for example, to measure conductivity in pipelines and then indicate "water," "product", "acid," and "base."

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ID	Element ID that is unique from all others in the AS	INT	-	I	U	+	Assigned automatically by the RC wizard
LEVEL_1	Limit value #1	REAL	-	I	VQ	-	Assignment of first limit value
LEVEL_2	Limit value #2	REAL	-	I	VQ	-	Assignment of second limit value
LEVEL_3	Limit value #3	REAL	-	I	VQ	-	Assignment of third limit value
LEVEL_4	Limit value #4	REAL	-	I	VQ	-	Assignment of fourth limit value
HYS	Hysteresis	REAL	-	I	VQ	-	Assignment of hysteresis.
ACTUAL	Current value from the process	REAL	-	I	VQ	-	-
ERROR	Indicates whether upstream element is in error state.	BOOL	-	I	VQ	-	1: Upstream element is faulty 0: Upstream element is not faulty
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element is not considered during next route search 0: Element will be taken into consideration in the route search
EV_ID1	Event ID for interrupt instance #1	DWORD	-	I	UQ	-	-
EV_ID2	Event ID for interrupt instance #2	DWORD	-	I	UQ	-	-
QID	ID assigned by the RC wizard and used by this route.	INT	-	O	VQ	+	-

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QRET_VAL	Return value of element:	WORD	-	O	VQ	-	0: No error 8461: Incorrect or invalid element ID 8463: Incorrect or unknown element type. Interface block does not correspond to the element type in the Route Control project configuration
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QLEVEL1	Binary signal indicating whether or not the limit value has been reached	BOOL	-	O	VQ	-	0: Limit value #1 not reached 1: Limit value #1 reached
QLEVEL2	Binary signal indicating whether or not the limit value has been reached	BOOL	-	O	VQ	-	0: Limit value #2 not reached 1: Limit value #2 reached
QLEVEL3	Binary signal indicating whether or not the limit value has been reached	BOOL	-	O	VQ	-	0: Limit value #3 not reached 1: Limit value #3 reached
QLEVEL4	Binary signal indicating whether or not the limit value has been reached	BOOL	-	O	VQ	-	0: Limit value #4 not reached 1: Limit value #4 reached

Project Engineering

1. Insert the block in a CFC chart.
2. Assign the LEVEL_1 to LEVEL_4
3. Assign a hysteresis.
4. Interconnect the ACTUAL parameter (actual value)
5. Interconnect the return value
6. Start the RC wizard and allow the element ID to be automatically entered.
7. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

Example

Guide: CFC for Conductivity

5.7.3 RC_IF_USER_SE (FB848)

Description

"RC_IF_USER_SE" provides an interface with user-definable feedback for creating user-defined sensor elements.

If the sensor is involved in the route, the feedback is evaluated according to the interconnection in the route (see Route Control project configuration).

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ID	Element ID that is unique from all others in the AS	INT	-	I	U	+	Assigned automatically by the RC wizard
FB_00	Bit 0 for element feedback see Feedback Bit Assignment	BOOL	-	I	VQ	-	0, 1
...	...	...	...	...	...	...	...
FB_12	Bit 12 for element feedback see Feedback Bit Assignment	BOOL	-	I	VQ	-	0, 1
ERROR	Indicates whether upstream element is in error state.	BOOL	-	I	VQ	-	1: Upstream element is faulty 0: Upstream element is not faulty
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element is not considered during next route search 0: Element will be taken into consideration in the route search
EV_ID1	Event ID for interrupt instance #1	DWORD	-	I	UQ	-	-
EV_ID2	Event ID for interrupt instance #2	DWORD	-	I	UQ	-	-
TypeName	Name for sensor element type	STRING [24]	„MY_SE"	I	V	-	Any character string up to 24 characters
QID	ID assigned by the RC wizard and used by this element.	INT	-	O	VQ	+	-
QRET_VAL	Return value of element:	WORD	-	O	VQ	-	0: No error 8481: Incorrect or invalid element ID

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-

Project Engineering

1. Insert RC_IF_USER_SE in a CFC chart
2. Edit the "TypeName" input. Change the name of the subtype of "MY_SE" to a name of your choosing.
3. Interconnection your user-defined block with the feedback signals.
4. Start the RC wizard and allow the element ID to be automatically entered.
5. Apply the element ID and the new subtype by importing S7 into the Route Control project engineering.

Note

In order to use this sensor element in routes, you still have to create relevant commands on the subtype in the Route Control project engineering tool and edit the control and feedback masks in accordance with the assignment of the feedback inputs on the block.

Example

User-defined sensor elements are created in the same way as control elements.

See Example for User-Defined Type

5.8 Parameter Elements

Parameter elements represent a setpoint (QVALUE_I, _D, _R) which can be further processed by user programs and takes an actual value (ACT_VAL) from the process. Parameter elements are used to specify setpoints whereby the setpoint specification can depend on a given route. For example, the calculation of the output amount may depend on the volume of a pipe.

Route Control provides two predefined PE types:

- RC_IF_VOLUME (FC808)
- RC_IF_TIMER (FC809)

An interface block is available for custom parameter elements. It can be called in the user program in order to access the internal PA data structures of Route Control:

- RC_IF_USER_PE (FC807)

Route Control distinguishes between two types of parameter elements:

- Internal parameter elements
- External parameter elements

Internal Parameter Elements

The setpoints of internal parameter elements are known at the time of configuration (Route Control), for example, volumes / quantity of a material in the pipes, fixed times, etc.

External Parameter Elements

The setpoints of external parameter elements are not known at the time of configuration (Route Control), for example, weighed quantities are usually specified by recipes. Whereas the setpoint is specified directly at the RPE (Route Parameter Element) as a property for an internal parameter element, it is configured as an index for external parameter element. This index references one of the outputs (EXT_..._I, ... = 1 to 24) at the route (RC_IF_ROUTE) during runtime, the setpoint there is passed by the route block to the outputs EXT_..._O and also output to the interface blocks of the parameter elements (RC_IF_VOLUME, RC_IF_TIMER etc.).

RC_IF_TIMER

A timer parameter element is used when an action should be performed at a specific time depending on the selected route, for example, material should only exit a pipe when the output valve has closed and the valve for the receptical tank has opened.

RC_IF_VOLUME

A volume parameter element is used when an action should be performed for a specific volume depending on the selected route, for example, material should only exit a pipe when the output valve has closed and the valve for the receptical tank has opened.

RC_IF_ROUTE (FB800)

5.8.1 RC_IF_VOLUME (FC808)

RC_IF_VOLUME is a parameter element block for a volumetric value. Both the RC_IF_VOLUME and RC_IF_TIMER blocks use the RC__PE_COMMON block internally.

Description

A parameter element specifies a setpoint. The actual value of the parameter element is only used for visualization on the Route Control Center.

If the parameter element is involved in the route, the setpoint is output according to the interconnection in the route (see Route Control project configuration). The parameter element feedback is not evaluated in the route.

Inputs and Outputs

See RC_PE_COMMON (FC810)

Return Values of Block

QRET_VAL	Meaning
0	No error
8102	Incorrect or invalid element ID
8103	For external parameter elements only: Index is outside the permissible range (1 to 24)
8104	For external parameter elements only: Route ID is outside the permissible range (1 to the maximum number of routes). The maximum number of routes is specified using the NoRoutes input on the FB850 RC_IF_CFG.

Project Engineering

1. Insert your own block in a CFC chart.
2. Interconnect your own block to process-related blocks, such as PCS 7 standard library blocks.
3. Start the RC wizard and allow the element ID to be automatically entered.
4. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

Note

To activate this parameter element in routes, you still have to create your own subtype with appropriate commands in the Route Control engineering tool.

Example

Guide: CFC Parameter Element

5.8.2 RC_IF_TIMER (FC809)

RC_IF_VOLUME is a parameter element block for a time value. Both the RC_IF_VOLUME and RC_IF_TIMER blocks use the RC_PE_COMMON block internally.

Description

A parameter element specifies a setpoint. The actual value of the parameter element is only used for visualization in the Route Control Center.

If the parameter element is involved in the route, the setpoint is output according to the interconnection in the route (see Route Control project configuration). The parameter element feedback is not evaluated in the route.

Inputs and Outputs

See RC_PE_COMMON (FC810)

Return Value of Block (QRET_VAL)

QRET_VAL	Meaning
0	No error
8102	Incorrect or invalid element ID
8103	For external parameter elements only: Index is outside the permissible range (1 to 24)
8104	For external parameter elements only: Route ID is outside the permissible range (1 to the maximum number of routes). The maximum number of routes is specified using the NoRoutes input on the FB850 RC_IF_CFG.

Project Engineering

1. Insert your own block in a CFC chart.
2. Interconnect your own block to process-related blocks, such as PCS 7 standard library blocks.
3. Start the RC wizard and allow the element ID to be automatically entered.
4. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

Note

To activate this parameter element in routes, you still have to create your own subtype with appropriate commands in the Route Control engineering tool.

5.8.3 RC_IF_USER_PE (FC807)

RC_IF_USER_PE is a parameter element block for a volumetric value. Internally, it uses the RC_PE_COMMON block.

Description

A parameter element specifies a setpoint. The actual value of the parameter elements is used for visualization in the Route Control Center.

If the parameter element is involved in the route, the setpoint is output according to the interconnection in the route (see Route Control project configuration). The parameter element feedback is not evaluated in the route.

Inputs and Outputs

See RC_PE_COMMON (FC810)

Additional input on RC_IF_USER_PE:

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
TypeName	Name for sensor element type	STRING [24]	--	I	V	-	Any character string up to 24 characters

Return Values of Block

QRET_VAL	Meaning
0	No error
8102	Incorrect or invalid element ID
8103	For external parameter elements only: Index is outside the permissible range (1 to 24)
8104	For external parameter elements only: Route ID is outside the permissible range (1 to the maximum number of routes). The maximum number of routes is specified using the *NoRoutes (number of routes)* input on the RC_IF_CFG (FB850).

Project Engineering

1. Insert the RC_IF_USER_PE block in a CFC chart.
2. Edit the "TypeName" input. Change the name of the subtype to a name of your choosing.
3. Interconnect your own block to process-related blocks, such as PCS 7 standard library blocks.
4. Start the RC wizard and allow the element ID to be automatically entered.
5. Apply the element ID and the new subtype by importing S7 into the Route Control project engineering.

Note

To activate this parameter element in routes, you still have to edit the unit for visualization on the Route Control Center on the subtype in the Route Control engineering tool.

Example

User-defined parameter elements are created in the same way as control elements.

See Example for User-Defined Type

5.9 Connection Elements

5.9.1 RC_IF_LE (FB828)

Description

The RC_IF_LE block stores the **state of a linking element** (LE) of the routing system (for example, the **material)**. It thus represents one unit of the material transport medium (for example, one piece of pipeline). Normally, one linking element is inserted for each partial route.
Note: A linking element must be inserted in the partial route when configuring permissible material sequences because these linking elements store the material that was last transported.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
ID	Element key that is unique from all others in the automation system Checked by the Route Control Wizard and, in the case of 0, a new ID is assigned.	INT	-	I	U	+	See Valid ID Ranges for CE, SE, LE, PE
DEF_VAL	Default value that can be transferred to the linking element using the SET_DEF input	INT	0	I	VQ	-	-
SET_DEF	Initiate transfer of default value (on rising edge)	INT	1	I	VQ	-	0 -> 1: Apply setpoint value
QID	ID assigned by the RC wizard and used by this route.	INT	-	O	VQ	+	-
QRET_VAL	Return value for block	BOOL	-	O		-	0: No error 8xxx:: Error
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error
QMAT_I	Material ID of linking element	INT	-	O	UQ	-	-
QMAT_DI	Material ID of linking element	DINT	-	O	VQ	+	-

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-

Project Engineering

1. Insert the block in a CFC chart.
2. Start the RC wizard and allow the element ID to be automatically entered.
3. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.
4. If necessary, after the "Compile OS" operation, display the QMAT_DI output as a signal to change colors in a WinCC picture.

5.10 Cross-Coupling

5.10.1 Overview of Cross-Coupling Blocks

For the configuration of cross-coupling between the automation systems that are relevant for Route Control, the following block is available:

RC_IF_CFG (FB850)

For diagnostics of cross-coupling, the following blocks are available:

RC_IF_XC_DIAG (FB884) and

RC_IF_XC_LIFE (FC884).

5.10.2 RC_IF_XC_DIAG (FB884)

Description

RC_IF_XC_DIAG is a diagnostic block for Route Control that provides detailed information about the status of the AS-AS connection(s) to other peer automation systems (cross-coupling). This function block is inserted centrally once for each AS and interconnected with RC_IF_CFG.

You only need to insert this block if you want to obtain diagnostic information about the AS-AS communication. The block should be inserted following RC_IF_CFG in the sequence group (OB) in which the AS-AS communication (cross-coupling) is being processed (see input OB_XC of RC_IF_CFG).

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
DiaDSNo	Indicates the data record for cross-coupling Interconnect this input with output DiaDSNo of RC_IF_CFG	INT	-	I	VQ	-	1 to 32
CHK_LEN	Activates length check	BOOL	-	I	VQ	-	0: Check disabled 1: Check enabled
QRET_VAL	Feedback value of the diagnostic block:	WORD	-	O	VQ	-	8831: Data record is missing 8832: Data record is invalid (DiaDSNo too large) 8833: The cross-coupling data block is missing (see QJOB_DB output)

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QJOB_DB	Number of the cross-coupling data block	INT	-	O	VQ	-	-
QXC_DB	Number of the send/receive data block	INT	-	O	VQ	-	-
QXC_IDB	Number of the cross-coupling channel (instance data block number)	INT	-	O	VQ	-	-
QINIT	Indicates whether or not the cross-coupling connection is currently being initialized	BOOL	-	O	VQ	-	0: Initialization is not underway 1: Initialization is currently active
QCHK_LEN	Indicates whether length check is taking place:	BOOL	-	O	VQ	-	0: Check is not underway 1: Check is currently active
QLEN1	Maximum length of connection #1	INT	-	O	VQ	-	-
QLEN2	Maximum length of connection #2	INT	-	O	VQ	-	-
CONN_ID1	Local NetPro ID for connection #1	WORD	-	O	VQ	-	-
CON1_PHS	Return value for system communication block SFB22 (physical status of connection #1) – as hexadecimal value	BYTE	-	O	VQ	-	10H: OK, no error 13H: Intervention required For additional values: see PHYS output of SFB STATUS (SFB 22)
CON1_STAT	Return value for system communication block SFB22 (operating status of peer AS connection #1) –	INT	-	O	VQ	-	0H: Peer AS in STOP status 2H: Peer AS in RUNNING status For additional values, see LOCAL output of SFB STATUS (SFB22)
CON1_ERR	Error display for system communication block SFB22 See ERROR output of SFB STATUS (SFB22)	BOOL	-	O	VQ	-	0: OK, no error 1: Error

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
CON1_DIA	Feedback value of system communication block SFB22 (standard feedback value for connection #1) – Decimal value: 25: Communication is being processed, no error For additional values, see STATUS output of SFB STATUS (SFB 22)	INT	-	O	VQ	-	-
CONN_ID2	Local NetPro ID for connection #2	...	...	O	...	...	...
CON2_PHS	Same as for connection #1	...	...	O	...	...	...
CON2_STAT	Same as for connection #1	...	...	O	...	...	...
CON2_ERR	Same as for connection #1	...	...	O	...	...	...
CON2_DIA	Same as for connection #1	...	...	O	...	...	...
PUTJOBNO	Point to job data record in cross-coupling data block (XC_JOB_DB)	INT	...	O	UQ	-	-
JOB_STATE	Status of cross-coupling job to be processed currently	INT	-	O	VQ	-	0: No job is pending (IDLE) 2: Job is underway (RUN) 4: Job sent successfully (DONE OK) 8: Job ended with error (DONE ERROR)
PUT_STEP	Status of algorithm for activation of SFB PUT in FB881 RC_XC_PCU_FB	INT	-	O	VQ	-	0: No job is pending (IDLE) 1: Data are being sent via connection #1 2: Waiting for a job on connection #1 to be concluded 3: Data are being sent via connection #2 4: Waiting for a job on connection #2 to be concluded

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
SEARC_STP	Status of search algorithm through data records of cross-coupling jobs:	INT	-	O	UQ	-	0: Initializing algorithm 1: Searching for next job 2: Waiting until peer AS is in RUN status 3: Processing job (next send job)
PUT1_ERR	Error display t of system communication block SFB15 (error value of connection #1)	BOOL	-	O	VQ	-	0: OK, no error 1: Error
PUT1_DIA	Feedback value of system communication block SFB15 (standard feedback value of connection #1) – hexadecimal value:	INT	-	O	VQ	-	For range, refer to STATUS output of SFB15
PUT2_ERR	Error display of system communication block SFB15 (error value of connection #2)	BOOL	-	O	UQ	-	0: OK, no error 1: Error
PUT2_DIA	Feedback value of system communication block SFB15 (standard feedback value of connection #2) – hexadecimal value:	INT	-	O	UQ	-	For range, refer to STATUS output of SFB15
JOB1_NO	Number of current job in send buffer	INT	-	O	UQ	-	-
JOB_TYPE	Job type:	INT	-	O	VQ	-	1: Job without acknowledgment of receipt 2: Job with acknowledgment of receipt
SRC_Block	Job source: data block number	INT	-	O	VQ	-	-
SRC_BYTE	Job source: offset (byte address)	INT	-	O	VQ	-	-
SRC_NUM	Job source: number of bytes to be sent	INT	-	O	VQ	-	-
DST_Block	Job destination: data block number	INT	-	O	VQ	-	-
DST_BYTE	Job destination: offset (byte address)	INT	-	O	VQ	-	-
START_TIM	Job start time in seconds since 1.1.1970	DINT	-	O	UQ	-	-
SEND_TIME	Job send time in seconds since 1.1.1970	DINT	-	O	UQ	-	-

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
SEND_STEP	Status of send job	INT	-	O	VQ	-	0: No job is pending 1: Job is currently being sent 2: Waiting for acknowledgment
WAIT_TIME	Current duration of send job in status 1 "Job being sent" in seconds	INT	-	O	VQ	-	-
MAX_TIME	Maximum time for job in seconds	INT	-	O	VQ	-	-
QUIT_PCU	Acknowledgment received from peer AS	INT	-	O	UQ	-	-
SND_MODE	Send mode	INT	-	O	VQ	-	1: Sending job without repetition 2: Waiting for acknowledgment (peer sets send status to 0)
RCV_STEP	Receive mode:	INT	-	O	VQ	-	0: No job is pending 1: Data are currently being received 2: Response is sent
SND_JOB	Job number in send buffer	INT	-	O	VQ	-	-
ANSWER	Shows whether an answer has been received from the peer:	BOOL	-	O	VQ	-	0: Waiting for response by peer 1: Response from peer AS has not been received within the maximum time (MAX_TIME parameter)

Configuration

1. Interconnect this DiaDSNo input with the DiaDSNo output of RC_IF_CFG
2. Select a connection index (1 to 32) by means of the DiaConIndx input on RC_IF_CFG.
   The RC_XC_DIAG block will now display diagnostic information about the selected connection.

5.10.3 RC_IF_XC_LIFE (FC884)

Description

At its output, this FC displays the AS number and seconds pulses sent by the peer AS. In this way, the connection between the two peer automation systems can be monitored to ensure that it remains intact and active.

You only need to insert this block if you want to obtain diagnostic information about the AS-AS communication.

The user can choose the insertion location of this block. We recommend insertion in OB32 or OB1.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Att.	OCM	Perm.values
QRET_VAL	Return value of block (hexadecimal)	INT	-	O	VQ	-	0: OK, no error 8333: Error; Data block XC_PCU_DB does not exist
REM_AS1	AS number of peer AS #1	INT	-	O	VQ	-	-
LIFEAS1	Seconds pulses, which continuously increase as long as communication is active. Connection to peer AS #1	INT	-	O	VQ	-	-
...	...	...	...	...	...	...	...
REM_AS31	AS number of peer AS #31	INT	-	O	VQ	-	-
LIFEAS31	Seconds pulses, which continuously increase as long as communication is active. Connection to peer AS #31	INT	-	O	VQ	-	-

Configuration

1. No configuration required.

5.11 Remote Elements

5.11.1 Overview of Remote Blocks

Note

These remote blocks are only required for communication between automation systems from multiple Route Control projects.

Blocks for remote elements are used when route elements from another Route Control project are to be used.

Remote blocks exist for the following elements:

RC_IF_REMOTE_CE (FB821)

RC_IF_REMOTE_SE (FB842)

RC_IF_REMOTE_PE (FB843)

Two additional communication blocks are required for the actual data exchange with the remote automation system that contains the remote elements:

RC_IF_REMOTE_SEND (FB831)

RC_IF_REMOTE_RECV (FB833)

For an example with CFC, go to:

Remote Elements, CFC Example

5.11.2 RC_IF_REMOTE_CE (FB821)

Note

These remote blocks are only required for communication between automation systems from multiple Route Control projects.

Description

The RC_IF_REMOTE_CE block is used to link control elements (CE) from one Route Control project to another automation system. One of these blocks must be inserted into a CFC chart and configured accordingly for each remote control element.

Organization Block (OB)

This block can be inserted into any organization block. However, note that all remote elements of a connection (i.e., with an identical SNDRCVDB) must be inserted into the same runtime group as the associated RC_IF_REMOTE_SND block.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
LOC_CE	ID of the control element in the local AS	INT	-	I	U	-	See Valid ID Ranges for CE, SE, LE, and PE
REM_CE	ID of the control element in the remote AS See Valid ID Ranges for CE, SE, LE, and PE	INT	-	I	VQ	-	See Valid ID Ranges for CE, SE, LE, and PE
SNDRVCDB	Number of data block in the local AS used for data exchange between the local and remote elements. For permitted value range	INT	-	I	VQ	-	See Valid SNDRCVDB Block Numbers for Remote Elements
ALT_VAL	Alternate value entered in the element in case of problems with communication with the remote AS or problems with the remote element. See also parameter QRET_VAL.	WORD	W#16#0000	I	VQ	-	Examples of ALT_VAL: 0: Element receives feedback "undefined" H8000: Element receives feedback "fault"

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
TypeName	CE subtype of the remote element. This parameter is required for an S7 import in the Route Control project engineering.	STRING [24]	"VALVE"	I	VQ	-	A CE subtype is, for example, MOTOR, VALVE, or another user-defined type.
QLOC_ID	ID of local control element	INT	-	O	VQ	-	See Valid ID Ranges for CE, SE, LE, and PE
QCOMM_ID	Serial number of the element in the central send data block (see SNDRCVDB)	INT	-	O	VQ	-	-
QCOMMAND	Diagnostic information: 16-bit value of the command that is transferred to the remote element.	WORD	-	O	VQ	-	-
QROUTE	ID of route	INT	-	O	UQ	-	-
QFUNC_ID	Function ID (FUNC_ID) of route	INT	-	O	UQ	-	-
Q_FBACK	Feedback value of the remote control element	WORD	-	O	VQ	-	-
QRET_VAL	Feedback value of the block:	WORD	-	O	VQ	-	8211: The CE ID entered is too small 8212: The CE ID entered is too big 8213: The CE ID of the peer element is too small 8214: The CE ID of the peer element is too big 8215: The number of the send/receive block (SNDRVCDB) is too small and is therefore outside of the permitted range. 8216: The number of the send/receive block (SNDRVCDB) is too large and is therefore outside of the permitted range.

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
QRET_VAL	Feedback value of the block:	WORD	-	O	VQ	-	*8217: You are attempting to transfer data from more control elements than is allowed. The total number of all CEs, SEs, and PEs* that can be linked remotely may not exceed 1,024. 8218: Timeout or receive error in the send/receive program. The alternate value (ALT_VAL) is used instead. 8219: The number of elements to be transferred does not match in the two peer automation systems. Remedy: Trigger a positive edge at the NEW_GEN input of the RC_IF_REMOTE_SEND (FB831) block. An initialization will be performed.
QERR	For details, see parameter QRET_VAL	BOOL	-	O	VQ	-	1: Error 0: OK

Configuration

Refer also to the example chart in the Route Control library and the example in this online Help (Remote Elements CFC Example).

2. Insert an RC_IF_REMOTE_CE block in a CFC chart of your project
3. Specify the ID of the remote element in the REM_CE parameter
4. Specify the data block to be used for data exchange in the SNDRVCDB parameter. This block number must be identical in both automation systems.
5. Specify an alternate value to be used in the event of a communication failure in the ALT_VAL parameter.
6. If you have not already done so, configure a central instance for remote communications. See RC_IF_REMOTE_RECV (FB833) and RC_IF_REMOTE_SEND (FB831)
7. Indicate the CE subtype of the remote element in the *TypeName* parameter.
8. Start the RC wizard and allow the element ID to be automatically entered. Note: If you want to create your own ID, you must edit the LOC_CE parameter before starting the Route Control Wizard.
9. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

5.11.3 RC_IF_REMOTE_PE (FB843)

Note

These remote blocks are only required for communication between automation systems from multiple Route Control projects.

Description

The RC_IF_REMOTE_PE block is used to link parameter elements (PE) from another Route Control range of another automation system. A RC_IF_REMOTE_PE block must be inserted in a CFC chart and configured accordingly for each remote parameter element.

Organization Block

This block can be inserted into any organization block. However, note that all remote elements of a connection (that is, elements with an identical SNDRCVDB) must be inserted in the same runtime group as the associated RC_IF_REMOTE_SND block.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
LOC_PE	ID of the parameter element in the local AS	INT	-	I	U	-	See Valid ID Ranges for CE, SE, LE, and PE
REM_PE	ID of the parameter element in the remote AS	INT	-	I	U	-	See Valid ID Ranges for CE, SE, LE, and PE
SNDRVCDB	Number of data block in the local AS used for data exchange between the local and remote elements. For permitted value range	INT	-	I	VQ	-	See Valid SNDRCVDB Block Numbers for Remote Elements
ALT_VAL	Alternate value entered in the element in case of problems with communication with the remote AS or problems with the remote element. See also parameter QRET_VAL. Any feedback of type Real is allowed.	REAL	-	I	VQ	-	-

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
TypeName	PE subtype of the remote element. This parameter is required for an S7 import in the Route Control project engineering.	STRING [24]	"VOLUME"	I	VQ	-	-
QLOC_ID	ID of local parameter element	INT	-	O	VQ	-	-
QCOMM_ID	Serial number of the element in the central send data block (see SNDRCVDB)	INT	-	O	VQ	-	-
QRET_VAL	Return value for block	WORD	-	O	VQ	-	8431: The PE ID entered is too small 8432: The PE ID entered is too big 8433: The PE ID of the peer element is too small 8434: The PE ID of the peer element is too big 8435: The number of the send/receive block (SNDRVCDB) is too small and is therefore outside of the permitted range. 8436: The number of the send/receive block (SNDRVCDB) is too big and is therefore outside of the permitted range.

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
QRET_VAL	Return value for block	WORD	-	O	VQ	-	8437: You are attempting to transfer data from more control elements than is allowed. The total number of all *CEs, SEs, and PEs* that can be linked remotely may not exceed 1,024. 8438: Timeout or receive error in the send/receive program. The alternate value (ALT_VAL) is used instead. 8439: The number of elements to be transferred does not match in the two peer automation systems. Remedy: Trigger a positive edge at the NEW_GEN input of the RC_IF_REMOTE_SEND (FB831) block. An initialization will be performed.
QERR	For details, see parameter QRET_VAL	BOOL	-	O	VQ	-	1: Error 0: OK
QSPVALUE	Setpoint sent to the remote parameter element	REAL	-	O	VQ	-	-
QACTV	Actual value of the remote parameter element	REAL	-	O	VQ	-	-
QINDEX	If this is an external parameter element, the index value is output here	BYTE	-	O	UQ	-	0: No external PE Greater than 0: External PE For the value range, refer to External Parameter Elements (Index)

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
QEXT	External: This is an external parameter element of the route. The setpoint of the parameter element was configured indirectly (by means of the index). Internal: The setpoint value of the parameter element was configured directly.	BOOL	-	O	UQ	-	0: Internal parameter element 1: External parameter element
QSUMMED	This is a summation parameter element.	BOOL	-	O	VQ	-	0: Not summing 1: Summing
QROUTE	ID of the route that is actively using this parameter element.	INT	-	O	UQ	-	-
QFUNC_ID	Function ID (FUNC_ID) of the route that is actively using this parameter element.	INT	-	O	UQ	-	-
QMODE_NO	Mode level of the route that is actively using this parameter element.	INT	-	O	UQ	-	-

Configuration

Same as for RC_IF_REMOTE_CE (FB821)

Refer also to the example in this online Help (Remote Elements CFC Example)

5.11.4 RC_IF_REMOTE_SE (FB842)

Note

These remote blocks are only required for communication between automation systems from multiple Route Control projects.

Description

The RC_IF_REMOTE_SE block is used to link sensor elements (SE) from another Route Control project in another automation system. One of these blocks must be inserted in a CFC chart and configured accordingly for each remote sensor element.

Organization Block

This block can be inserted into any organization block. However, note that all remote elements of a connection (that is, elements with an identical SNDRCVDB) must be inserted in the same runtime group as the associated RC_IF_REMOTE_SND block.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
LOC_SE	ID of the sensor element in the local AS	INT	-	I	U	-	See Valid ID Ranges for CE, SE, LE, and PE
REM_SE	ID of the sensor element in the remote AS	INT	-	I	U	-	See Valid ID Ranges for CE, SE, LE, and PE
SNDRVCDB	Number of data block in the local AS used for data exchange between the local and remote elements. For permitted value range	INT	-	I	VQ	-	See Valid SNDRCVDB Block Numbers for Remote Elements
ALT_VAL	Alternate value entered in the element in case of problems with communication with the remote AS or problems with the remote element. See also parameter QRET_VAL.	WORD	W#16#0000	I	VQ	-	Examples of ALT_VAL: 0: Element receives feedback "false" 1: Element receives feedback "true" H8000: Element receives feedback "fault"
TypeName	Type of remote element	STRING [24]	"SENSOR"	I	VQ	-	-

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
QLOC_ID	ID of local sensor element	INT	-	I	U	-	See Valid ID Ranges for CE, SE, LE, and PE
QCOMM_ID	Serial number of the element in the central send data block (see SNDRCVDB)	INT	-	O	VQ	-	-
Q_FBACK	Feedback value of the remote sensor element	WORD	-	O	VQ	-	-
QROUTE	ID of route	INT	-	O	UQ	-	-
QFUNC_ID	Function ID (FUNC_ID) of route	INT	-	O	UQ	-	-
QRET_VAL	Return value for block	WORD	-	O	VQ	-	8421: The SE ID entered is too small 8422: The SE ID entered is too big 8423: The SE ID of the peer element is too small 8424: The SE ID of the peer element is too big 8425: The number of the send/receive block (SNDRVCDB) is too small and is therefore outside of the permitted range. 8426: The number of the send/receive block (SNDRVCDB) is too large and is therefore outside of the permitted range.

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
QRET_VAL	Return value for block	WORD	-	O	VQ	-	*8427: You are attempting to transfer data from more control elements than is allowed. The total number of all CEs, SEs, and PEs* that can be linked remotely may not exceed 1,024. 8428: Timeout or receive error in the send/receive program. The alternate value (ALT_VAL) is used instead. 8429: The number of elements to be transferred does not match in the two peer automation systems. Remedy: Trigger a positive edge at the NEW_GEN input of the RC_IF_REMOTE_SEND (FB831) block. An initialization will be performed.
QERR	For details, see parameter QRET_VAL	BOOL	-	O	VQ	-	1: Error 0: OK

Configuration

Same as for RC_IF_REMOTE_CE (FB821)

Refer also to the example in this online Help (Remote Elements CFC Example)

5.11.5 RC_IF_REMOTE_RECV (FB833)

Note

This block is only required for communication between automation systems from multiple Route Control projects.

Description

The RC_IF_REMOTE_RECV block is the user interface for assigning parameters to the cross-coupling connection between Route Control automation systems on the receive side of available *remote elements*. This block represents the counterpart to the RC_IF_REMOTE_SEND (FB831) block in the peer AS.

Organization Block

This block can be inserted into any organization block.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
CON_ID	Local communication ID for accessing the peer AS (from NetPro connection configuration)	WORD	-	I	VQ	-	-
SNDRCVDB	Number of the data block to be used for communication and data exchange with the peer AS.	INT	91	I	VQ	-	-
RES_HIS	Resets the fault memory	BOOL	-	I	UQ	-	0: Fault memory is retained 1: Fault memory is reset at each positive edge
SND_TIME	Time interval in seconds between two send requests to the peer AS	INT	2	O	UQ	-	-
ERR_SND	Maximum value in seconds for send request After timeout, a "Timeout for Send" error message is displayed, and the send request is repeated.	INT	30	O	UQ	-	-
ERR_RCV	Maximum value in seconds to receive data. After timeout, a "Timeout for Receive" error message is displayed, and the send request is repeated. Default setting: 30 s	INT	30	O	UQ	-	-

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	UQ	-	-
QERR	Positive edge triggers a request for a new communication ID for all remote element blocks.	BOOL	-	O	VQ	-	-
S_STATUS	The return value of the internal BSEND call is passed through to the outside	INT	-	O	VQ	-	For return values, see BSEND block
S_HISTORY	Diagnostics: Most recent error of the internal BSEND call This memory is reset by a positive edge at input RES_HIS	INT	-	O	UQ	-	-
R_STATUS	The return value of the internal BRCV call is passed through to the outside	INT	-	O	VQ	-	For return values, see BRCV block
R_HISTORY	Diagnostics: Most recent error of the internal BRCV call This memory is reset by a positive edge at input RES_HIS	INT	-	O	UQ	-	For return values, see BRCV block
C_STATUS	Return value for block	INT	-	O	VQ	-	0: No error 100: Timeout for receive (RCV) 101: Timeout for send (SND)
C_HISTORY	Diagnostics: Most recent error of the block (see C_STATUS parameter)	INT	-	O	UQ	-	-
QSND_TIM	Diagnostics: Current time in seconds since last BSEND initiation	INT	-	O	UQ	-	-
QRCV_TIM	Diagnostics: Current time in seconds since last data receive operation	INT	-	O	UQ	-	-

Configuration

1. Create a NetPro connection to the peer automation system in the remote process cell.
   Note 1: The local ID of the NetPro connection must be the same for both peers!
   Note 2: NetPro connections to remote process cells cannot be created in the Route Control Wizard.
2. Enter the NetPro connection communication ID that enables access to the peer AS containing the element. (CON_ID parameter)
3. Specify the data block to be used for data exchange in the SNDRVCDB parameter. This block number must be identical in both automation systems.

Refer also to the example in this online Help (Remote Elements CFC Example)

5.11.6 RC_IF_REMOTE_SEND (FB831)

Note

This block is only required for communication between automation systems from multiple Route Control projects.

Description

This block provides the interface for assigning parameters to the cross-coupling connection between Route Control automation systems on the send side of available *remote elements*. This block represents the counterpart to the RC_IF_REMOTE_RECV (FB833) block in the peer AS.

Organization Block

This block can be inserted into any organization block. However, note that all remote elements of a connection (i.e., with an identical SNDRCVDB) must be inserted into the same runtime group as the associated RC_IF_REMOTE_SND block.

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
CON_ID	Local communication ID for accessing the peer AS (from NetPro connection configuration)	WORD	-	I	VQ	-	-
SNDRCVDB	Number of the data block to be used for communication and data exchange with the peer AS.	INT	91	I	VQ	-	-
NEW_GEN	Positive edge triggers a request for a new communication ID for all remote element blocks.	BOOL	-	I	VQ	-	0 → 1: Initiate request
RES_HIS	Resets the fault memory	BOOL	-	I	UQ	-	0: Fault memory is retained 1: Fault memory is reset at each positive edge
SND_TIME	Time interval in seconds between two send requests to the peer AS	INT	2	I	UQ	-	-
ERR_SND	Maximum value in seconds for send request After timeout, a "Timeout for Send" error message is displayed, and the send request is repeated. Default setting: 30 s	INT	30	I	UQ	-	-

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
ERR_RCV	Maximum value in seconds to receive data. After timeout, a "Timeout for Receive" error message is displayed, and the send request is repeated. Default setting: 30 s	INT	30	I	UQ	-	-
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	UQ	-	-
QERR	Indicates whether or not a block error is pending	BOOL	-	O	VQ	-	1: An error has occurred in the block 0: No pending errors in the block For detailed information, see S_STATUS, R_STATUS, and C_STATUS.
S_STATUS	The return value of the internal BSEND call is passed through to the outside	INT	-	O	VQ	-	For return values, see BSEND block
S_HISTORY	Diagnostics: Most recent error of the internal BSEND call This memory is reset by a positive edge at input RES_HIS	INT	-	O	UQ	-	-
R_STATUS	The return value of the internal BRCV call is passed through to the outside	INT	-	O	VQ	-	For return values, see BRCV block
R_HISTORY	Diagnostics: Most recent error of the internal BRCV call This memory is reset by a positive edge at input RES_HIS	INT	-	O	UQ	-	For return values, see BRCV block
C_STATUS	Return value for block	INT	-	O	VQ	-	0: No error 100: Timeout for receive (RCV) 101: Timeout for send (SND)
C_HISTORY	Diagnostics: Most recent error of the block (see C_STATUS parameter)	INT	-	O	UQ	-	-
QNEW_GEN	Initialization of communication ID for all remote blocks has begun	BOOL	-	O	VQ	-	0: Initialization not requested 1: Initialization requested

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
QGEN_ACT	Initialization of communication ID for all remote blocks is active	BOOL	-	O	VQ	-	0: Initialization is currently active 1: Initialization is not active
QSND_TIM	Diagnostics: Current time in seconds since last BSEND initiation	INT	-	O	UQ	-	-
QRCV_TIM	Diagnostics: Current time in seconds since last data receive operation	INT	-	O	UQ	-	-

Configuration

1. Create a NetPro connection to the peer automation system in the remote process cell.
   Note 1: The local ID of the NetPro connection must be the same for both peers!
   Note 2: NetPro connections to remote process cells cannot be created in the Route Control Wizard.
2. Enter the NetPro connection communication ID that enables access to the peer AS containing the element (CON_ID parameter)
3. Specify the data block to be used for data exchange in the SNDRVCDB parameter. This block number must be identical in both automation systems.
4. Optional: Once you have switched to online mode, you can create a positive edge one time (NEW_GEN parameter) to initialize the block. However, this also occurs automatically when the automation system is started up.

Refer also to the example in this online Help (Remote Elements CFC Example)

5.12 Kernel Blocks

5.12.1 Overview of Kernel Blocks

The following are kernel blocks for Route Control:

- Blocks for processing routes
- Blocks for processing elements
- Blocks for coupling to the OS (RC server)
- Blocks for coupling to other RC automation systems (cross-coupling)

For each kernel block, you will find a brief explanation of what the block is used for. Because the kernel blocks are not interface blocks for interconnecting user blocks or other library blocks, a description of inputs and outputs is not provided here.

5.12.2 Data Blocks (DB)

5.12.2.1 RC_CE_FIELD (DB99)

Description

The RC_CE_FIELD data block contains the data records for control elements.

5.12.2.2 RC_CFG (DB100)

Description

Internal, AS-centralized configuration block of the routing system. Direct access as performed in Route Control V5 is no longer required or permitted! In V6, block FB850 RC_IF_CFG acts as an interface.

5.12.2.3 RC_DATA_TG34_36 (DB405)

Description

This block is required for the general request that occurs when the RC server is first started.

5.12.2.4 RC_FIFO1 (DB870)

Description

This data block acts as a circular buffer in the AS for OS (RC server) telegrams.

5.12.2.5 RC_FIFO1_SE (DB874)

Description

This data block acts as a send buffer in the AS for OS (RC server) telegrams.

5.12.2.6 RC_FIFO4 (DB890)

Description

This data block acts as a circular buffer in the AS for OS (RC server) telegrams.

5.12.2.7 RC_FIFO4_SE (DB894)

Description

This data block acts as a send buffer in the AS for OS (RC server) telegrams.

5.12.2.8 RC_IDB_SEND_FIFO1 (DB590)

Description

This is the instance data block for FB890 "RC_SEND_FIFO1".

5.12.2.9 RC_IDB_SEND_FIFO4 (DB593)

Description

This is the instance data block for FB891 "RC_SEND_FIFO4".

5.12.2.10 RC_LE_FIELD (DB96)

Description

The RC_LE_FIELD data block contains the data records for linking elements.

5.12.2.11 RC_PE_FIELD (DB97)

Description

The RC_PE_FIELD data block contains the data records for parameter elements.

5.12.2.12 RC_REMOTE1 to RC_REMOTE5 (DB91 to DB95)

Description

Internal data blocks with send/receive area for elements in another AS (remote elements).

5.12.2.13 RC_ROUTE1 to RC_ROUTE300 (DB101 to DB400)

Description

Internal data structures: Each one of these data blocks contains data for a route. DB101 corresponds to the route with ID 1, DB102 corresponds to route ID 2, etc.

If it is known which IDs are not being used in the entire routing system, then the corresponding data blocks can be deleted to free up memory in the AS.

5.12.2.14 RC_SE_FIELD (DB98)

Description

The RC_SE_FIELD data block contains the data records for sensor elements.

5.12.2.15 RC_SYS_DB (DB410)

Description

Internal data structure

5.12.2.16 RC_TG34_TG36_DB (DB404)

Description

This block is required within the context of the AS-OS (RC server) coupling.

5.12.2.17 RC_XC_1 to RC_XC_31 (DB751 to DB781)

Description

These are instance blocks for FB880 RC_XC_FB.

5.12.2.18 RC_XC_JOB (DB705)

Description

Internal data structure used in the context of AS-AS communication (cross-coupling).

5.12.2.19 RC_XC_JOB_START (DB450)

Description

This block is used in the context of AS-AS communication (cross-coupling).

5.12.2.20 RC_XC_PCU (DB704)

Description

This data block is used in the context of AS-AS communication (cross-coupling).

5.12.2.21 RC_XC_PUTX_1 to RC_XC_PUTX_31 (DB451 to DB481)

Description

Internal data structure used in the context of AS-AS communication (cross-coupling).

5.12.3 User-Defined Types (UDT)

5.12.3.1 RC_ANY_UDT (UDT506)

Description

Internal data type for the routing system.

5.12.3.2 RC_CE_FIELD_UDT (UDT99)

Description

Internal data structure

5.12.3.3 RC_EXT_PE_ACTV (UDT103)

Description

Internal data structure for processing external parameter elements.

5.12.3.4 RC_FIFO_UDT (UDT670)

Description

Internal data structure

5.12.3.5 RC_LE_FIELD_UDT (UDT96)

Description

Internal data structure

5.12.3.6 RC_PE_FIELD_UDT (UDT97)

Description

Internal data structure

5.12.3.7 RC_RE_INFO_UDT (UDT109)

Description

Internal data structure

5.12.3.8 RC_RE_UDT (UDT100)

Description

Internal data structure

5.12.3.9 RC_REM_CESEPE (UDT104)

Description

Internal data structure for elements in another AS (remote elements)

5.12.3.10 RC_REQUEST_BUFFER_UDT (UDT111)

Description

Internal data structure

5.12.3.11 RC_ROUTE_CFG (UDT105)

Description

Internal data structure

5.12.3.12 RC_ROUTE_CM_UDT (UDT110)

Description

Internal data structure

5.12.3.13 RC_ROUTE_TB_UDT (UDT102)

Description

Internal data structure

5.12.3.14 RC_SE_FIELD_UDT (UDT98)

Description

Internal data structure

5.12.3.15 RC_SEPU_UDT (UDT674)

Description

Internal data structure

5.12.3.16 RC_SYS_UDT (UDT120)

Description

Internal data structure

5.12.3.17 RC_XC_JOB_UDT (UDT705)

Description

This internal data structure is used in the context of AS-AS communication (cross-coupling).

5.12.3.18 RC_XC_PCU_UDT (UDT704)

Description

This internal data structure is used in the context of AS-AS communication (cross-coupling).

5.12.3.19 RC_XC_PUT_DB_UDT (UDT452)

Description

This internal data structure is used in the context of AS-AS communication (cross-coupling).

5.12.3.20 RC_XC_PUT_SD_UDT (UDT684)

Description

This internal data structure is used in the context of AS-AS communication (cross-coupling).

5.12.3.21 RC_XC_PUT_UDT (UDT683)

Description

This internal data structure is used in the context of AS-AS communication (cross-coupling).

5.12.3.22 RC_XC_PUTX_UDT (UDT451)

Description

Internal data structure used in the context of AS-AS communication (cross-coupling).

5.12.3.23 RC_XC_UDT (UDT101)

Description

Internal data structure used in the context of AS-AS communication (cross-coupling).

5.12.4 Function Blocks (FC)

5.12.4.1 RC_ATTRIB_PTR (FC860)

Description

Internal block for routing system.

5.12.4.2 RC_CALL_KILLER (FC814)

Description

Internal block for routing system.

5.12.4.3 RC_DB_AREA_COPY (FC862)

Description

Internal block for copying blocks between two data blocks.

5.12.4.4 RC_FC_COPY (FC863)

Description

Internal auxiliary block

5.12.4.5 RC_FIFO_DEBUG_SEND (FC891)

Description

Internal system block that stores the diagnostic messages of SFB BSEND in the routing system.

5.12.4.6 RC_FIFO_INPUT_FC (FC890)

Description

This block is required for communication between the AS and the OS (RC server). It transfers all telegrams from the AS to the RC server to a circular buffer (FIFO)

5.12.4.7 RC_FIFO_SEND (FC803)

Description

The RC_FIFO_SEND block sends telegrams to the OS (RC server) by means of BSEND.

5.12.4.8 RC_KERNEL_CALL (FC804)

Description

This internal block contains all calls of the RC kernel blocks required to process the route lists (DB101 and higher).

5.12.4.9 RC_LE_DGRAMM (FC825)

Description

This internal block generates update telegrams for the linking elements.

5.12.4.10 RC_LOAD_AR1 (FC861)

Description

Internal auxiliary block

5.12.4.11 RC_MASTER_CREATE_ERR (FC851)

Description

This block is required to generate alarm messages for a route.

5.12.4.12 RC_MAT (FC836)

Description

Internal auxiliary block for execution of material functions.

5.12.4.13 RC_PE_COMMON (FC810)

Description

RC_PE_COMMON is a block that is inserted (i.e., is called) in a block created by the user. RC_CE_COMMON serves as the interface between the user block and the internal data of a parameter element of the routing system, and it transfers signals between the user block and the data register of a parameter element (PE).

A parameter element specifies a setpoint. The actual value of the parameter element is only used for visualization in the Route Control Center. A setpoint/actual value comparison does not take place. The setpoints are provided in various data types (DINT, INT, REAL).

If the parameter element is involved in the route, the setpoint is output according to the interconnection in the route (see Route Control project configuration). The parameter element feedback is not evaluated in the route.

Note

This block cannot be used directly. Rather, it must be integrated in a user block. Consequently, "IF" is not part of its name.

See Example for User-Defined Type

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
ID	Element ID that is unique from all others in the AS	INT	-	I	U	+	Assigned automatically by the RC wizard
FACTOR	Scaling factor for output values QVALUE_I and QVALUE_D: QVALUE_D=RND(FACTOR*QVALUE_R) QVALUE_I=INT(RND(FACTOR*QVALUE_R))	REAL	1.0	I	VQ	-	-
DIS_ACTV	Internal application of current (actual) value can be prevented	BOOL	-	I	VQ	-	1: Value is prevented from being output 0: Value is output
ACT_VAL	Return value from the process, e.g., from an EPAR_REAL	REAL	-	I	VQ	-	-
DEF_VAL	Configurable alternate value that is output if no route is operating with this parameter element.	REAL	0.0	I	VQ	-	-

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
EN_DEF	Allow use of alternate value	BOOL	FALSE	I	VQ	-	1: Output of alternate value activated 0: Output of alternate value is not activated
QID	ID assigned by the RC wizard and used by this route.	INT	-	O	VQ	+	-
QRET_VAL	Return value for block	WORD	-	O	VQ	-	0: No error 8102: Incorrect or invalid element ID 8103: For external parameter elements only: Index is outside the permissible range (1 to 24) 8104: For external parameter elements only: Route ID is outside the permissible range (1 to the maximum number of routes). The maximum number of routes is specified using the NoRoutes input on the FB850 RC_IF_CFG.
QVALUE_I	Setpoint as a 16-bit integer	INT	-	O	VQ	-	INT value of real value generated according to the formula QVALUE_I = INT(QVALUE_D)
QVALUE_D	Setpoint as a 32-bit integer	DINT	-	O	VQ	-	INT value of real value generated according to the formula QVALUE_D = RND(FACTOR*QVALUE_R)
QVALUE_R	Setpoint as a 32-bit floating-point number	REAL	-	O	VQ	-	Real setpoint that is output to the process

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
QINDEX	Value of parameter element is indirectly referenced using an index. The value pending on the input corresponding to this index on the RC_IF_ROUTE is output. Indirect referencing is used if the parameter element setpoint is not yet known at the time of project engineering and is created, for example, during runtime by means of a batch parameter. See also parameter QEXT	BYTE	-	O	UQ	-	0: Internal parameter element 1..24: Setpoint index (see RC_IF_ROUTE) of the external parameter element
QEXT	Use external setpoint	BOOL	-	O	UQ	-	1: The parameter element uses an external (indirectly referenced) setpoint 0: The parameter element uses an internal, directly referenced setpoint See also parameter QINDEX
QSUMMED	Summed parameter element Sum means that all of the parameter elements involved in the route are added (summed), and the result is provided as a setpoint to all of the parameter elements. Only parameter element setpoints of the same type (for example, volumes or weight) are added.	BOOL	-	O	UQ	-	1: Parameter element (setpoint) is a sum. 0: Parameter element (setpoint) is not a sum
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QMODE_NO	Mode level of route activating this element	INT	-	O	UQ	-	-

Configuration

1. Create your own block that calls RC_PE_COMMON, transfers parameters, and evaluates return values.
2. Insert your own block in a CFC chart.
3. Interconnect your own block to process-related blocks, such as PCS 7 standard library blocks.
4. Start the RC wizard and allow the element ID to be automatically entered.
5. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

Note

To activate this parameter element in routes, you still have to create your own subtype with appropriate commands in the Route Control engineering tool.

5.12.4.14 RC_ROUTE_CE_ERR (FC812)

Description

This block is required to send update telegrams for the control elements to the RC server.

5.12.4.15 RC_ROUTE_PE_DGRAM (FC822)

Description

This block is used to send update telegrams for the parameter elements to the RC server.

5.12.4.16 RC_ROUTE_SE_ERR (FC813)

Description

This block is used to send update telegrams for the sensor elements to the RC server.

5.12.4.17 RC_TG34_03 (FC811)

Description

This block combines particular telegrams and sends them to the RC server.

5.12.4.18 RC_UPD_CESEPE (FC823)

Description

Internal block for processing element data

5.12.4.19 RC_UPD_CESEPE_EX (FC824)

Description

Internal block for processing element data

5.12.4.20 RC_XC_CALL (FC805)

Description

Internal block used in the context of cross-coupling among automation systems.

5.12.4.21 RC_XC_JOB_USER (FC885)

Description

This block is used in the context of AS-AS communication (cross-coupling).

5.12.4.22 RC_XC_PUTX_RECV (FC882)

Description

This block is used in the context of AS-AS communication (cross-coupling).

5.12.4.23 RC_XC_PUTX_SEND (FC881)

Description

This block is used in the context of AS-AS communication (cross-coupling).

5.12.4.24 RC_XFER_LE (FC826)

Description

This block is used in the context of cross-coupling for linking element data.

5.12.4.25 RC_XFER_MON_FLT (FC829)

Description

Internal block to transfer times for status monitoring and fault tolerance from FB800 RC_IF_ROUTE to the route lists RC_ROUTE1 to RC_ROUTE300 (DB101 to DB400).

5.12.5 Function Blocks (FB)

5.12.5.1 RC_CALL_DIAG (FB851)

Description

RC_CALL_DIAG is an internal block for diagnostic processing.

5.12.5.2 RC_CE_COMMON (FB827)

Description

RC_CE_COMMON is a block that is inserted (i.e., is called) in a block created by the user. RC_CE_COMMON serves as the interface between the user block and the internal data of a control element of the routing system, and it transfers signals between the user block and the data register of a control element (CE).

If the control element is involved in the route, the element is activated according to the interconnection in the route (see Route Control project configuration). The element feedback is evaluated in the route simultaneously.

Note

This block cannot be used directly. Rather, it must be integrated in a user block. Consequently, "IF" is not part of its name.

See Example for User-Defined Type

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
ACTIVE	Indicates whether the upstream element has left the idle position.	BOOL	-	I	VQ	-	1: No idle position 0: Idle position
AUT_MAN	Automatic or manual control type of upstream element	BOOL	-	I	VQ	-	1: Upstream element is in manual mode 0: Upstream element is in automatic mode
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element is not considered during next route search 0: Element will be taken into consideration in the route search

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
ERROR	Indicates whether upstream element is in error state.	BOOL	-	I	VQ	-	1: Upstream element is faulty 0: Upstream element is not faulty
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	UQ	-	-
...	...	...	...	...	...	...	...
EV_ID3	Event ID for alarm instance #3	DWORD	-	I	UQ	-	-
FB_00	Feedback bit #0	BOOL	-	I	VQ	-	0, 1: Meaning depends on upstream element
...	...	...	...	...	...	...	...
FB_12	Feedback bit #12	BOOL	-	I	VQ	-	0, 1: Meaning depends on upstream element
ID	Element ID that is unique from all others in the AS	INT	-	I	U	+	Assigned automatically by the RC wizard
LOCK	Specifies whether an upstream element is locked. See LOCK Input on Element Blocks	BOOL	-	I	VQ	-	1: Upstream element is locked and will not be taken into consideration in the next route search 0: Upstream element is not locked and will be taken into consideration in the next route search
MONITOR	Feedback signal monitoring	BOOL	TRUE	I	VQ	+	1: Monitoring of feedback signals is active 0:Feedback signal monitoring is deactivated; feedback is being simulated.

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
PEND_OOS	"Pending out of Service"	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search 0: Maintenance is not pending. Element will be taken into consideration in the next route search
QID	ID assigned by the RC wizard and used by this route.	INT	-	O	VQ	+	-
QBA_EN	Indicates whether element can be used within the context of a batch. See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element will be used as part of BATCH 0: Element will not be used as part of BATCH
QOCCUPIED	Indicates whether the element is occupied by a batch See SIMATIC BATCH documentation	BOOL	-	O	VQ	-	1: Element is occupied by a batch 0: Element is not occupied by a batch
QRET_VAL	Return value of element:	WORD	-	O	VQ	-	0: No error 8271: Incorrect or invalid element ID
Q_C_00	Control command Bit #0	BOOL	-	O	VQ	-	0, 1: Meaning depends on upstream element
...	...	...	...	...	...	...	...
Q_C_15	Control command Bit #15	BOOL	-	O	VQ	-	0, 1: Meaning depends on upstream element
QMAINT	Element in maintenance	BOOL	-	O	UQ	+	1: Element is "in maintenance" 0: Element is available
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QBA_NA	Element is occupied by a batch with this name in BATCH. This name will be transferred in the route block and passed through by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QMODE_NO	Mode level of route activating this element	INT	-	O	UQ	-	-
QSIMU	Element in simulation	BOOL	-	O	UQ	-	1: Feedback will be simulated 0: The return value of the upstream element will be applied

Configuration

1. Create your own block that calls RC_CE_COMMON, transfers parameters, and evaluates return values.
2. Insert your own block in a CFC chart.
3. Interconnect your own block to other blocks, such as standard library blocks, SC blocks, or the PTE library.
4. Interconnect your own block to process-related blocks, such as PCS 7 standard library blocks.
5. Start the RC wizard and allow the element ID to be automatically entered.
6. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

Note

In order to activate this control element in routes, you still have to enter your own subtype in the Route Control engineering tool (RC wizard) and furnish the subtype with appropriate commands.

Example

An example using the RC_CE_COMMON can be found in the appendix in

Guide: CFC Overview Examples

Example for User-Defined Type

An example for creating your own block is available in "USER_CE" STL source code in the "EXAMPLE_USER_CE" block container of the Route Control block library.

5.12.5.3 RC_CLOCK (FB899)

Description

This block is the interface between the realtime clock of the AS and the routing system.

5.12.5.4 RC_MASTER_BUFFER (FB856)

Description

Internal block for managing a data buffer during a route request.

5.12.5.5 RC_MASTER_FUNC (FB852)

Description

Internal auxiliary block for a master route

5.12.5.6 RC_MASTER_MATERIAL (FB860)

Description

Internal block for route control for material management of a route in manual and automatic mode.

5.12.5.7 RC_MASTER_MSG (FB857)

Description

This block is required to issue alarm messages for a route.

5.12.5.8 RC_MASTER_TIMES (FB859)

Description

Internal auxiliary block for generating time functions for a master route.

5.12.5.9 RC_MASTER_XC_SND (FB858)

Description

Internal auxiliary block for communication between a master route and the associated slave routes in another AS.

5.12.5.10 RC_ROUTE (FB801)

Description

The RC_ROUTE block is the internal counterpart to RC_IF_ROUTE and performs route processing.

5.12.5.11 RC_ROUTE_GET_EXT_PE (FB818)

Description

This block is used in connection with external parameter elements of a route.

5.12.5.12 RC_ROUTE_MAT (FB819)

Description

This block is used within the context of material processing for a route.

5.12.5.13 RC_ROUTE_RCE_OFF (FB804)

Description

The RC_ROUTE_RCE_OFF block disables the elements of a route in accordance with its properties, such as OFF delay times.

5.12.5.14 RC_ROUTE_RCE_ON (FB803)

Description

The RC_ROUTE_RCE_ON block enables the elements of a route in accordance with its properties, such as ON delay times.

5.12.5.15 RC_ROUTE_STATE_OS (FB807)

Description

The RC_ROUTE_STATE_OS block checks to see if there are any update telegrams for a route to be sent to the RC server.

5.12.5.16 RC_ROUTE_STATES (FB809)

Description

Internal block that controls the status chart of a route list.

5.12.5.17 RC_ROUTE_TELEGR (FB808)

Description

The RC_ROUTE_TELEGR block sends the update message frames of a route to the RC server.

5.12.5.18 RC_ROUTE_TIME (FB805)

Description

The RC_ROUTE_TIME function block is responsible for managing all times used in the routing system.

5.12.5.19 RC_ROUTE_XC_PE_ACTV (FB817)

Description

This block is used in the context of cross-coupling of parameter element data.

5.12.5.20 RC_ROUTE_XC_REC (FB802)

Description

The RC_ROUTE_XC_REC block works together with the RC_ROUTE block and receives cross-coupling data from peer ASs.

5.12.5.21 RC_ROUTE_XC_SEND (FB806)

Description

The RC_ROUTE_XC_SEND function block sends data to peer ASs involved in the route.

5.12.5.22 RC_ROUTE_XC_SND_ORDER (FB816)

Description

This block is used to transfer the request data of a route to the peer ASs involved in the route.

5.12.5.23 RC_ROUTEMASTER (FB854)

Description

Internal block that control the status chart of a master route.

5.12.5.24 RC_ROUTEMASTER_TELE99 (FB855)

Description

This block sends telegrams with the name of the batch and the unit to the OS (RC server).

5.12.5.25 RC_ROUTEMASTER_TELEGR (FB853)

Description

This block sends request telegrams to the OS (RC server).

5.12.5.26 RC_SE_COMMON (FB847)

Description

RC_SE_COMMON is the interface block between a sensor and the routing system.

RC_SE_COMMON is a block that is inserted (i.e., called) in a block created by the user. RC_SE_COMMON serves as an interface between a sensor and the data memory of a sensor element (SE) of the routing system. If the sensor is involved in the route, the feedback is evaluated according to the interconnection in the route (see Route Control project configuration).

Note

This block cannot be used directly. Rather, it must be integrated in a user block. Consequently, "IF" is not part of its name.

See Example for User-Defined Type

Inputs and Outputs

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
ID	Element ID that is unique from all others in the AS	INT	-	I	U	+	Assigned automatically by the RC wizard
FB_00	Return value bit #0	BOOL	-	I	VQ	-	0, 1
...	...	...	...	...	...	...	...
FB_12	Return value bit #12	BOOL	-	I	VQ	-	0, 1
FB_13 to 15	Cannot be used; required as system-internal FBs						
ERROR	Indicates whether upstream element is in error state.	BOOL	-	I	VQ	-	1: Upstream element is faulty 0: Upstream element is not faulty
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element is not considered during next route search 0: Element will be taken into consideration in the route search
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	UQ	-	-
EV_ID2	Event ID for alarm instance #2	DWORD	-	I	UQ	-	-
QID	ID assigned by the RC wizard and used by this route.	INT	-	O	VQ	+	-

Parameter	Meaning	Type	Default	I/O	Attr.	OCM	Permitted Values
QRET_VAL	Return value of element:	WORD	-	O	VQ	-	0: No error 8571: Incorrect or invalid element ID
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (see QRET_VAL) 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-

Configuration

1. Create your own block that calls RC_SE_COMMON internally.
2. Insert your own block in a CFC chart.
3. Interconnect your own block.
4. Start the RC wizard and allow the element ID to be automatically entered.
5. Transfer the element ID by performing an S7 Import operation to the Route Control project configuration.

5.12.5.27 RC_SEND_FIFO1 (FB890)

Description

Internal block for sending telegrams to the RC server (master).

5.12.5.28 RC_SEND_FIFO4 (FB891)

Description

Internal block for sending telegrams to the RC server (standby).

5.12.5.29 RC_TG_36 (FB813)

Description

Internal block for route control during telegram processing (sending to RC server).

5.12.5.30 RC_TG34_TG36 (FB812)

Description

This block is required to transfer telegrams to the RC server.

5.12.5.31 RC_TIME_DELTA (FB879)

Description

Internal auxiliary block for determining time intervals.

5.12.5.32 RC_TIME_RCE (FB810)

Description

This block is a clock pulse generator for activating elements that are switched on with a time delay or that pulsate on and off.

5.12.5.33 RC_XC_DIAG (FB897)

Description

This internal block is required for AS-AS communication (cross-coupling) diagnostics.

5.12.5.34 RC_XC_FB (FB880)

Description

This block is used in the context of AS-AS communication (cross-coupling).

5.12.5.35 RC_XC_INIT (FB896)

Description

This block is used in the context of AS-AS communication (cross-coupling).

5.12.5.36 RC_XC_JOB_FB (FB882)

Description

This block is used in the context of AS-AS communication (cross-coupling).

5.12.5.37 RC_XC_JOB_TIME_FB (FB885)

Description

This block is used in the context of AS-AS communication (cross-coupling).

5.12.5.38 RC_XC_PCU_FB (FB881)

Description

This block is used in the context of AS-AS communication (cross-coupling).

5.12.5.39 RC_XC_REMOTE_RECV (FB834)

Description

This block is used in the context of AS-AS communications (cross-coupling with a remote process cell).

5.12.5.40 RC_XC_REMOTE_SEND (FB832)

Description

This block is used in the context of AS-AS communications (cross-coupling with a remote process cell).

5.12.5.41 RC_XC_STAT_FB (FB883)

Description

This block is used in the context of AS-AS communication (cross-coupling).

5.12.5.42 RC_ZTG (FB895)

Description

Internal block within the context of time processing of the routing system.

6 Configuration Guide

6.1 Installation

6.1.1 Guide: Installation

User Task

You wish to install SIMATIC Route Control as a:

- Engineering station
- Route Control server
- Route Control operator station (WinCC with a Route Control faceplate only)
- Route Control operator station (WinCC Route Control faceplate and Route Control Center)

Solution

Start the PCS 7 system setup and select the desired configuration. Follow the instructions provided by the PCS 7 system setup.

6.2 Introduction

6.2.1 Guide: Introduction

The objective of this guide is to supplement the online Help and manuals and to facilitate your work with Route Control by providing an overview and a number of examples.

It is also intended to be a "common thread" that provides a coherent correlation between various sections of the online Help and the manuals.

Sections

This guide is divided into several sections:

Chapter	Description
	The overview presents the tools and functions of Route Control with respect to particular topics.
	This chapter presents the most important areas to be configured in Route Control.
	A number of typical use cases complete this guide. This chapter provides concrete solution approaches and suggestions, some of which include images of CFC charts and interconnected blocks.

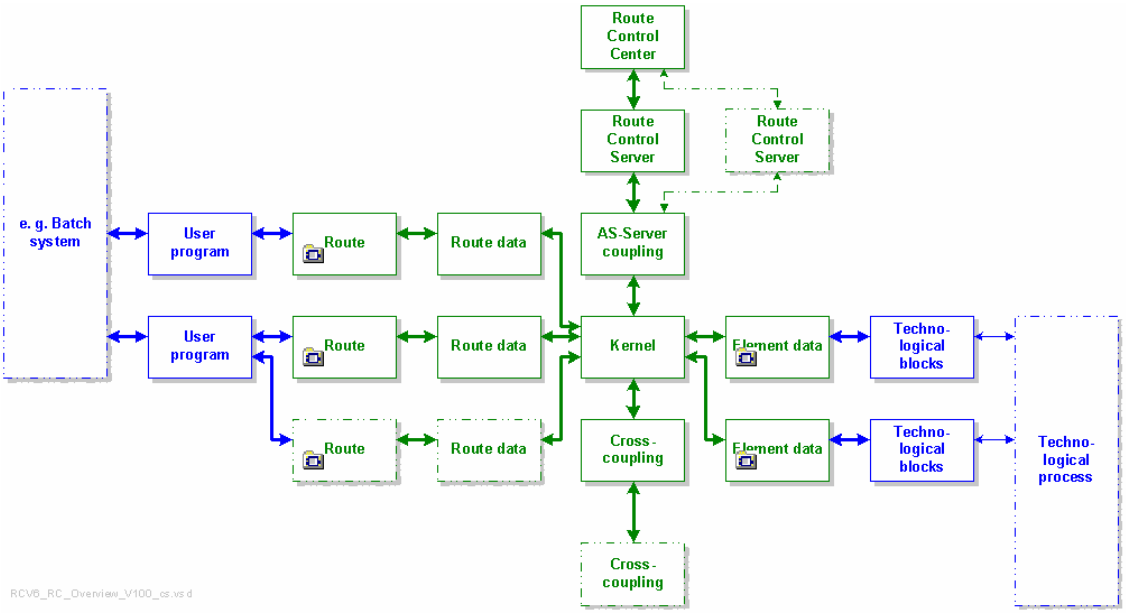
Sections

All chapters have the same structure:

Section	Description
User Task	Typical areas of application and user tasks from practical applications. These are followed by examples of a proposed solution.
Solution	Describes the general project engineering procedure and the tools used.
Example	Proposed solution for an actual project engineering case with a number of figures illustrating, for example, an interconnection in CFC.
Check List	The most important points to be taken into account during the project engineering and the learning objectives of this section

6.2.2 Guide: Route Control, Overview

A basic description of the tasks of each Route Control component is provided to help you get started.



Key:

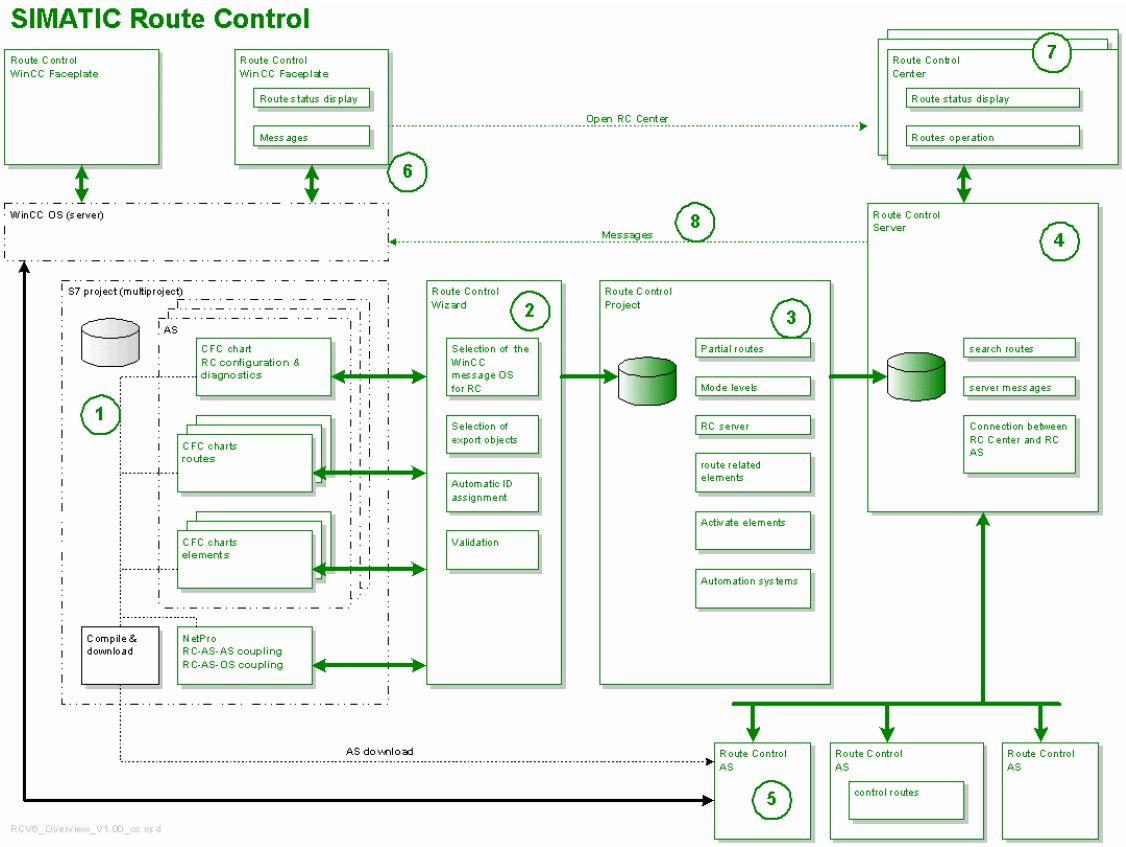
xxx	No Route Control objects
xxx	Route Control objects
	Route Control interface block

6.2.3 Guide: Route Control, General (Architecture)

User Task

You want a comprehensive overview of the components of Route Control and their interaction.

Architecture



You will find information about each area of Route Control in these sections:

1. Project engineering in the context of an S7 project
2. Interface between S7 project engineering and RC project engineering (RC wizard)
3. Route Control project engineering
4. Route Control server
5. Route Control automation systems
6. Route Control WinCC faceplate
7. Route Control Center
8. Route Control messages

6.2.4 Guide: Route Control, General (Project Engineering)

SIMATIC S7 Project

The SIMATIC S7 project is the central data management and project engineering environment. All other tools of Route Control can be accessed from SIMATIC Manager: You start the Route Control project engineering interface (engineering tool) and the Route Control Wizard from the menu.

Route Control Project

In a Route Control project, you add special objects for route control (partial routes, mode tables, and mode levels) to your project engineering. In addition, these elements are assigned to partial routes (that is, elements are inserted in partial routes), whereby additional specifications are also made, including element activation, mode, and special features like switch-on delay times and fault tolerance times, etc.

Route Control Wizard

To avoid a time-consuming duplicate project engineering (of elements, in particular), the Route Control Wizard helps you export elements from the S7 project to the Route Control project. For each AS, you can specify which object groups you would like to export: control, sensor, parameter, and linking elements.

6.2.5 Guide: Route Control, General (Server, Client)

Route Control Server

The main task of the Route Control server, which can also be part of a redundant configuration for reasons of availability, is to find possible routes in the configured route network upon the request of the AS. The search itself can be influenced by various parameters, such as locked elements or elements that are already occupied by another material transport; elements in manual mode; checking of material sequences; locked partial routes, etc. In addition, the Route Control server acts as a connection between the automation system and the user interfaces (Route Control Center) by displaying relevant objects for Route Control.

Route Control Center

The Route Control Center is an application that displays detailed information about a route. In addition to the status of a route, the Route Control Center also displays all elements and their status (setpoint, actual value, and mode level). Operators can also actively intervene by requesting, starting, stopping, and ending a route. Depending on the level of authorization, other locations for the source and destination of the material transport, the material, the mode table, etc., can also be defined.

Route Control Faceplate in WinCC

The Route Control faceplate is a user interface to display and manipulate the main statuses and modes of a route. A block icon is added to a WinCC picture and interconnected with an instance of the RC_IF_ROUTE block type using an RC faceplate wizard. During runtime, the block icon can be used to open the Route Control faceplate. In addition to the route status, the faceplate also displays messages pertaining to a route. Operators can also actively intervene, request, start, stop, and end the route, however, new source or destination locations cannot be selected here. From this faceplate, it is possible to switch to the BATCH Control Center (if installed), the Route Control Center, and an SFC dialog (if configured).

6.2.6 Guide: Route Control, General (AS)

Route Control Automation System

The Route Control automation systems assume the most important part of material transport. Except for the route search, the entire material transport control (that is, control of elements involved in the route) takes place in the AS. Because the elements for a material transport can be spread out over several automation systems, the exchange of setpoint and actual values of these elements or rather, mode levels, is integrated in Route Control. The AS-AS connections can be configured with the help of the RC wizard. During runtime, data transfer is transparent to the user. That is, the user program does not need to ensure cross-AS data transfer. The individual interfaces are: RC_IF_ROUTE for a route, RC_IF_... blocks for the elements for interfacing process-related elements from the standard library (each AS has several of these), and the configuration and diagnostic blocks RC_IF_CFG, RC_IF_XC_DIAG, and RC_IF_XC_LIFE (each AS has one of these).

Interaction of Areas

SIMATIC Manager and the Route Control project represent the basic environment for the Route Control project engineering. On the whole, all relevant information for Route Control is stored in both project environments (automation systems, servers, elements, partial routes, etc.).

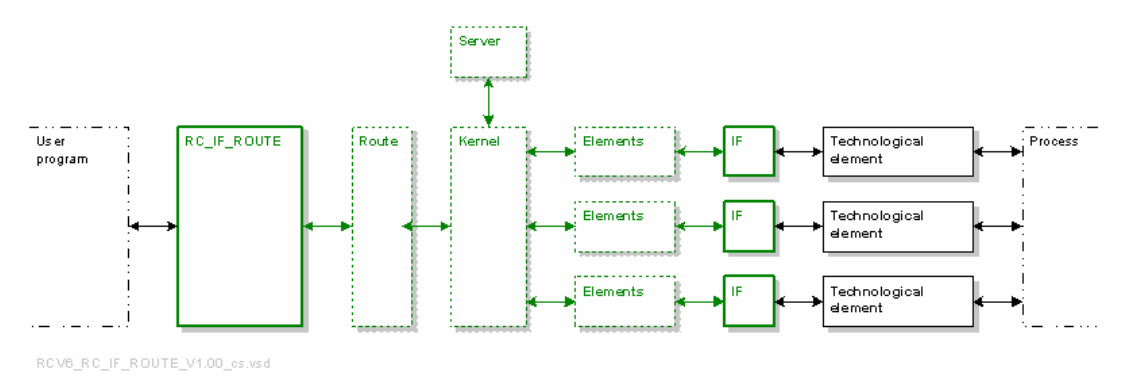
The project engineering is partially downloaded to the AS (CFC blocks and Route Control kernel) and partially transferred to WinCC (messages and tags for picture creation). The Route Control project is copied to the RC server and read in there during startup. During runtime, the RC blocks request a route (that is, element lists) in the AS. The server searches for a route, assigns elements, and writes these lists to the automation systems. At this point, the AS takes over control of the elements. Monitoring and operator control of routes can be performed from the Route Control faceplate (via WinCC channels) and the Route Control Center (via a connection to the RC server).

The automation system provides an interface to the process (that is, to the process-related elements), controls routes and elements, including cross-coupling among automation systems, and evaluates feedback from the elements.

6.2.7 Guide: Route Control, General (User Program)

User Program

The user program controls a material transport (a route) and has a direct connection to the RC_IF_ROUTE block, but not the elements.



In addition to a number of additional parameters that are relevant for the route search, the user program also specifies the source and destination of the material transport and requests the route. The route or the kernel requests the route and receives a list of elements. Once the route has started, the elements are activated according to their project engineering (operating mode and mode level).

The data of the elements are published by means of interface blocks (indicated on the display with IF). The RC_IF_... interface blocks are interconnected to technological blocks, for example, from the standard library. Setpoints are passed to the technological blocks, and actual values (feedback) are transferred to the kernel.

Master and Slave Automation System

A material transport can affect elements from several automation systems. The automation system containing the user program and the RC_IF_ROUTE block is called the *Master AS*, and the additional automation systems involved in the transport are referred to as *Slave AS*.

Check List

- You understand the separation between engineering (SIMATIC Manager, Route Control), RC server, RC AS, and the operator interfaces (RC block icon and faceplate, RC Center)
- You know which tasks are covered by each area.

6.2.8 Guide: Route Control Configuration

Now that you have had an initial overview of the individual components of Route Control, we will now present a detailed description of how to configure the Route Control server and the automation systems. Two different configurations are possible: a system with only one server (standalone configuration) or a system with two servers (redundant configuration).

6.2.9 Guide: Predefined Element Types

User Task

You would like to know which element types are already predefined and how you can add your own element types.

Solution

Both the Route Control library and the project engineering environment contain predefined element types for the following four groups:

- Control elements (and subtypes)
- Parameter elements (and subtypes)
- Sensor elements
- Linking elements

Example

You can find a list of interface blocks for elements in Route Control Blocks. For a description of how to create and add your own block types, refer to Example of a User-Defined Type.

Check List

1. You are familiar with the four main groups (element type groups).
2. You are familiar with the subtypes.
3. You can create your own type, use it in a CFC chart, and add it to the Route Control project engineering.

6.2.10 Guide: Printing Out a Project

User Task

You would like to print out the project engineering for elements and partial routes from your Route Control project.

Solution

First select one of the following objects:

- Partial route under a mode group with all of its interconnected elements
- Automation system under the "Automation Systems" folder
- One of the following groups under an automation system: "Control elements," "Sensor elements," "Linking elements," or "Parameter elements"
- Process cell
- Unit under a process cell

Use the File / Report / Preview menu command to open a window displaying the print preview.

Use the File / Report / Print menu command to send the print job.

Example

Check List

1. You are familiar with the "Preview" and "Print" operations.
2. You know how to obtain a print preview and send a print job.

6.2.11 Guide: Setting Up a New Project

User Task

You have installed PCS 7 V6 and would now like to begin a new S7 project along with a Route Control project.

Solution

Before starting a new project, we recommend that you read the instructions for project setup. These instructions contain information about possible sources of error and how they should be handled.

1. Install Route Control including library
2. Create an S7 project (single project or multiproject)
3. Configure the hardware (HW Config)
4. Copy all blocks from the "System Blocks\Blocks" program folder of the Route Control library to the master data library of your project. Required RC blocks are added to the AS block container (offline container) by using these FBs and FCs in CFC charts. Tip: To improve memory utilization, unneeded data blocks can be deleted. See Optimization: Memory Requirement in the AS.
5. Configure the plant hierarchy
6. Create a CFC chart and insert the RC_IF_CFG block
7. In the CFC editor, set the reserved ranges using the "Options / Settings / Compile and Download" menu command, see CFC - Setting Block Ranges. It is important that the upper limit setting be increased (DB to 899, FC to 899). Enter this correction in the master data library of your S7 project, too.
8. Configure the routes (RC_IF_ROUTE) and elements (RC_IF_MOTOR, etc.)
9. Compile and download the block to the automation system, see Downloading Blocks to the AS (User Blocks)
10. Perform export and import to the Route Control project engineering.
11. In the Route Control project engineering, create partial routes and interconnect elements.

Example

Check List

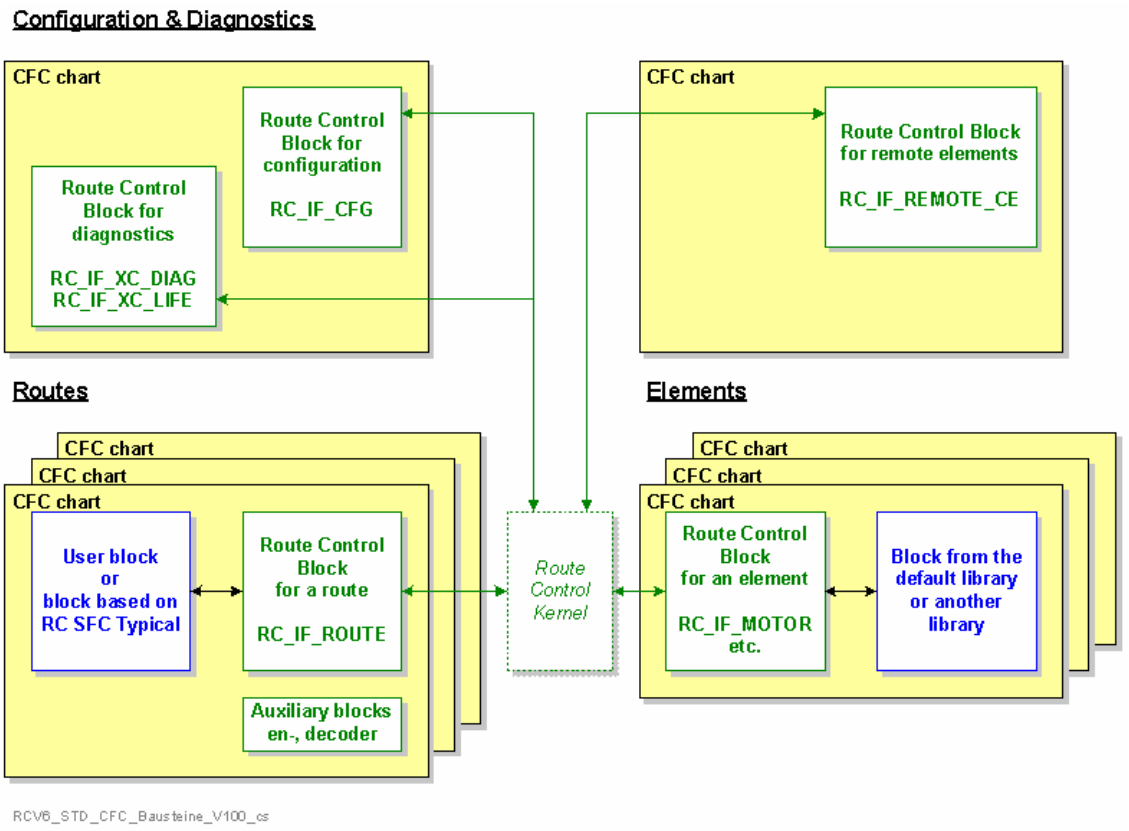
1. An S7 project is available.
2. Global settings have been made (block ranges)
3. CFC charts are available for the following:
   - RC_IF_CFG
   - RC_IF_XC_DIAG
   - RC_IF_XC_LIFE
   - RC_IF_ROUTE
   - RC_IF_MOTOR, etc.
4. A Route Control project is available
5. Blocks have been compiled and downloaded.

6.3 Configuring with SIMATIC Manager

6.3.1 CFC - Overview

The blocks for the routing system can be divided into five basic ranges:

1. Route Control configuration and diagnostics (RC_IF_CFG, RC_IF_XC_DIAG, RC_IF_XC_LIFE, one per AS)
2. Route Control route blocks (RC_IF_ROUTE, n per AS)
3. Route Control element blocks (RC_IF_..., n per AS)
4. Route Control remote elements (RC_IF_REMOTE_CE, etc., up to n per AS, as required)
5. Route Control kernel blocks (RC_... (without _IF_ in the name), Kernel, one per AS)
6. The following figure illustrates the interaction of the most important blocks:



6.3.2 Route Control Blocks (Run Sequence)

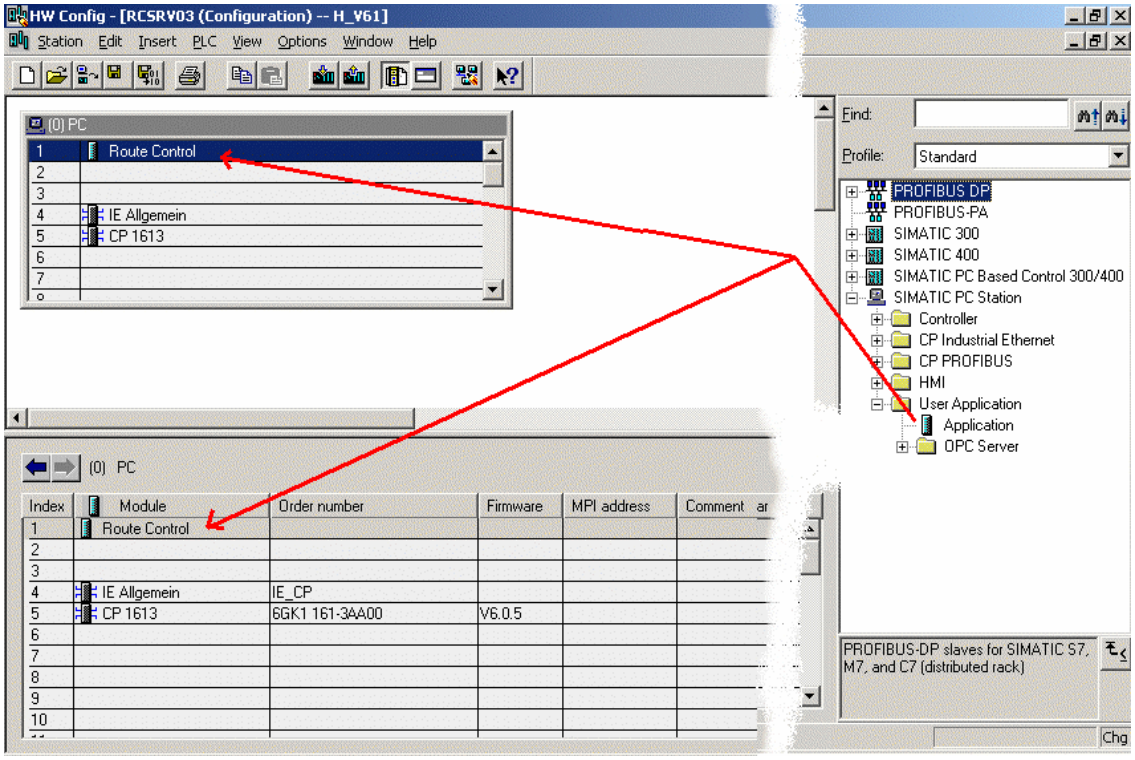
The following block run sequence is recommended:

1. User blocks that activate a route (SFC, phase, user program, etc.)
2. RC_IF_ROUTE
3. RC_IF_CFG
4. RC_IF_DIAG (inserted in OB in which cross-coupling is processed, see input OB_XC on block RC_IF_CFG)
5. RC_IF_XC_LIFE
6. RC_IF_... (all element blocks)
7. Process-related blocks connected to the RC_IF_... interface blocks

6.3.3 Hardware Configuration (HW Config)

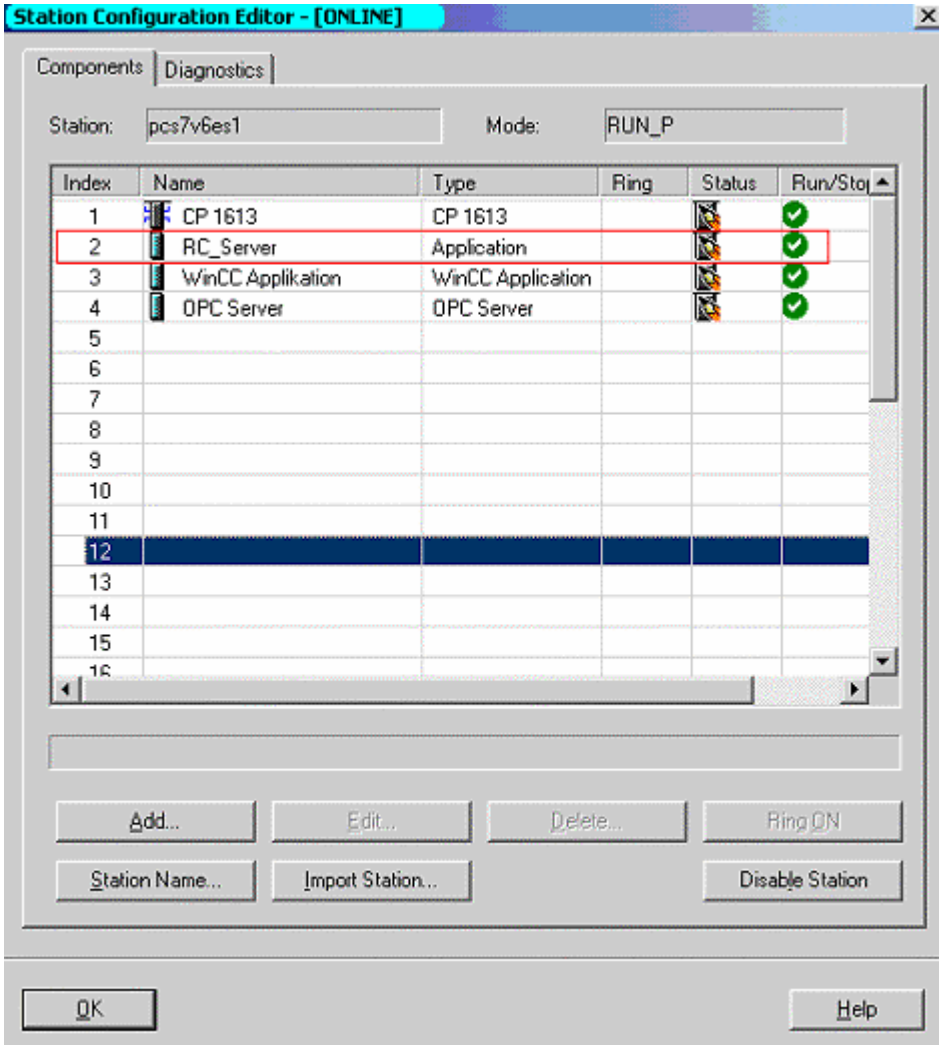
A Route Control server is configured as an RC application in HW Config. Proceed as follows:

1. Insert a new PC station.
2. Insert an "RC application" (or RC application (stby) or RC application client) in this PC station.
3. The Route Control Wizard creates the connections between the RC applications and the RC automation systems.
4. Download this configuration to the target station (Component Configurator).
5. Start the Route Control server (configuration must be loaded).
6. The Route Control server now establishes the (named) connections to the automation systems.


HW Config - [RCSRV03 (Configuration) -- H_V61]
Station Edit Insert PLC View Options Window Help
(0) PC
1 Route Control
2
3
4 IE Allgemein
5 CP 1613
6
7
Find:
Profile: Standard
PROFIBUS DP
PROFIBUS-PA
SIMATIC 300
SIMATIC 400
SIMATIC PC Based Control 300/400
SIMATIC PC Station
Controller
CP Industrial Ethernet
CP PROFIBUS
HMI
User Application
Application
OPC Server
(0) PC
Index Module Order number Firmware MPI address Comment
1 Route Control
2
3
4 IE Allgemein IE_CP
5 CP 1613 6GK1 161-3AA00 V6.0.5
6
7
8
9
10
PROFIBUS-DP slaves for SIMATIC S7, M7, and C7 (distributed rack)
Chg

6.3.4 Component Configurator

The Component Configurator must be downloaded to the server PC station:



6.4 S7 Project

6.4.1 Guide: Configuring the Automation Systems

User Task

You would like to prepare and configure an automation system for Route Control. You specify whether the configuration should have only one automation system or more than one automation system.

Solution

A CFC chart, called a Route Control configuration chart, is inserted for each automation system. This chart contains the blocks that are mandatory to operate Route Control in an automation system and for which parameters must be assigned. If you are only using one automation system in your project, then only one block is needed for the configuration:

- RC_IF_CFG (FB850)

If you are using two or more automation systems in your project, we recommend that you also include the following two blocks:

- RC_IF_XC_DIAG (FB884)
- RC_IF_XC_LIFE (FC884)

These two blocks are used for diagnostics of data communication between automation systems. Both blocks can be inserted in the same CFC chart as the RC_IF_CFG block.

Tip

When you configure the RC_IF_CFG block, the Route Control Wizard helps you with assignment of an automation system ID and a communication ID for cross-coupling between automation systems.

An instance of the RC_IF_CFG block enables Route Control, or the RC wizard, to 'recognize' a 'Route Control automation system.'

Example

Guide: CFC Configuring One Automation System

Guide: CFC Configuring One of Multiple Automation Systems

Check List

- Insert a new CFC chart for each automation system
- Insert the RC_IF_CFG block for each automation system
- If the project contains more than one automation system, insert RC_IF_DIAG and RC_IF_LIFE
- Start the Route Control Wizard, automatically assign the automation system IDs and communication IDs, create the required connections in NetPro.

6.4.2 Guide: Configuring AS-AS and AS-OS Connection

User Task

The connections between the AS and the OS participating in route control must be configured. Note that this involves two different *connection types*:

- AS-AS connection, also referred to below as cross-coupling
- AS-OS connection, also referred to below as a server connection

Solution

Note

AS-AS connections exist within a Route Control project and are used to exchange data by means of PUT jobs.

At the same time, AS-AS connections across Route Control projects are also possible. In this case, data are exchanged between automation systems using BSEND/BRCV jobs.

The third variant involves AS-OS connections in which the peers also exchange data using BSEND/BRCV jobs.

The connection data for AS-AS connections (cross-coupling) and AS-OS connections (RC server) are specified in NetPro. The RC wizard can provide assistance for this task. It ensures that the connection IDs are uniquely assigned and provides a framework that prevents errors and simplifies diagnostics.

Example of an AS-AS Connection in a Route Control Project (PUT)

- NetPro connection (Route Control Wizard) is created. The wizard also provides the automation system_ID_01 to AS_ID_32 and ASConn1 to ASConn32 parameters on RC_IF_CFG.
- Automation system is configured with regard to Route Control
- Data are transferred to the Route Control project (Export and Import wizard)

Example of an AS-AS Connection in a Route Control Project (BSEND/BRCV)

- These connections cannot be created in the Route Control Wizard. You (the user) must therefore create a connection in NetPro for each peer automation system.
- This is an S7 connection to an unknown (unspecified) peer
- The local communication ID in NetPro must match the peer ID
- Special communication blocks (RC_IF_REMOTE_SEND and RC_IF_REMOTE_RECV) must be inserted in a CFC chart for processing in the automation system program.
- The local communication IDs from NetPro must be configured in these two blocks
- For an example, refer to Overview of Remote Blocks and Remote Elements, CFC Example

Example of an AS-OS Connection (Standalone, BSEND/BRCV)

- AS-OS communication link is configured (NetPro)
- Parameters are assigned for communication link (RC wizard)
- Data are transferred to the RC project (Export and Import wizard)
- RC project: TCP/IP address is assigned

Example of an AS-OS Connection (Redundant RC Server, BSEND/BRCV)

- Same procedure as for standalone
- RC project: Another RC application is inserted (standby)
- RC project: A TCP/IP address is assigned for standby

Check List

- You are familiar with the three types of AS-AS connections: AS-AS within a Route Control project, AS-AS across Route Control projects, and AS-OS.
- You know which type of communication is used in each case.
- You know which tasks can be performed by the wizard, and which tasks you (the user) must perform yourself. You have configured the connections yourself in NetPro or you have had them configured by the RC wizard.
- You have set the properties of the RC server or servers in the RC wizard and exported them to the RC project engineering, where you have assigned the TCP/IP address.

6.4.3 Guide: CFC Charts

User Task

In addition to the relevant centralized configurations for a Route Control AS, the CFC charts for a route and the elements must be created.

Solution

Exactly one CFC chart with an RC_IF_CFG-type block must be configured for each automation system. Optionally, two additional blocks, RC_IF_XC_DIAG and RC_IF_XC_LIFE, can be placed for diagnostics. These two blocks are then required for diagnostics if cross-coupling is used in Route Control (only if the Route Control project contains more than one AS).

One instance of block type RC_IF_ROUTE is required per material transport (or route). We recommend that you create a separate CFC chart for each route to include the user program and an optional RC_IF_DECODER and RC_IF_ENCODER, as well as the RC_IF_ROUTE.

Separate CFC charts should also be created for the elements, because in addition to the Route Control interface block (such as an RC_IF_MOTOR), the technological block from the standard library (e.g., the MOTOR block) and other auxiliary blocks are also inserted in the CFC charts.

Examples for CFC Charts

- Guide: CFC Overview, Examples

Check List

- For each automation system, you have inserted one centralized CFC chart in which a block of type RC_IF_CFG has been placed and configured.
- You have created one (or more) CFC charts and placed blocks of type RC_IF_ROUTE for route activation by the user program.
- You have created one (or more) CFC charts and placed blocks of type RC_IF_VALVE, RC_IF_MOTOR, or a similar type to activate process-related elements.

6.4.4 Guide: Route Control, SFC Type

User Task

You would like to use a standardized basic framework as the basis for your user program for route control.

Solution

You copy the Route Control SFC type from the Route Control library to your project and adjust it according to your requirements. The Route Control SFC type includes a number of steps that are identical for all route control processes:

1. Assignment of 'static' parameters * (source, destination, mode table, material, route ID, timers)
2. Requesting the route
3. Starting the route
4. Controlling the material transport (specification of mode level feedback evaluation)
5. Specification of another material and external setpoints
6. Holding the route
7. Ending the route
8. * With respect to the duration of a material transport

Examples

SFC: Schematic

SFC: Mode Levels

SFC: Start Conditions for Holding

Check List

- You are familiar with the Route Control SFC type and know how to use it as a basis for your own SFC user programs.
- You are familiar with each state or branch of the SFC type and which actions can typically be carried out in each one.
- You know which data are exchanged between the user program (SFC) and the route.

6.5 Route Control Wizard

6.5.1 Guide: Route Control Wizard

User Task

1. The AS-AS and AS-OS connection data relevant for route control must be configured.
2. The project engineering is simplified as follows:
   - Element IDs that have not yet been configured (=0) are assigned automatically.
   - Element IDs that have already been configured (<>0) are checked for validity and corrected, if necessary.
   - Elements already configured in the CFC charts are transferred to the Route Control project.
3. Moreover, the plant hierarchy from the S7 project must be available in the Route Control project.
4. In addition, the routes (ID + dynamic or fixed assignment) must also be
   - Checked and
   - Transferred to the Route Control project
5. The message server (WinCC OS) that is to receive messages during runtime from the Route Control server or servers must be specified.

Solution

The Route Control Wizard helps you specifically with these tasks by providing appropriate interfaces and selection dialogs. The Route Control Wizard guides you through a number of dialogs in which you can make the relevant settings, corrections, and selections. You start the wizard in SIMATIC Manager under *Options / SIMATIC Route Control / Wizard* to perform the following tasks:

- Check and, if possible, automatically correct element IDs (if this is not possible, you can/must correct the ID manually or correct the error)
- Select the connection data and provide parameter inputs to the instances of block type RC_IF_CFG (central configuration of an RC AS)
- Select and transfer the RC server properties to the Route Control project
- Select and transfer elements from the CFC charts of the S7 project to the Route Control project
- Transfer route instances (RC_IF_ROUTE block) and, when available, route IDs to the Route Control project
- Transfer the plant hierarchy

Example (Dialogs of the RC Wizard)

For the individual steps with the corresponding dialogs of the Route Control Wizard, refer to Route Control Wizard: Selection of Actions and subsequent topics.

Check List

- You have followed the Route Control Wizard instructions and dialogs and have selected the objects to be checked and exported them.
- The wizard may have suggested other IDs for elements or routes. If you have not made any changes, these will be accepted.
- You have selected a message server. Route Control messages will be created in this WinCC OS.
- Elements that are selected will be exported automatically.
- Finally, you have received a log providing information about the actions selected by you and performed by the wizard and their results.
- You can now start the import to the Route Control engineering project; see also Transferring Data from an S7 Project

6.5.2 Guide: Exporting Routes

User Task

You would like to specify the routes, route IDs, and a pool of available route IDs for dynamic ID assignment in an S7 project and then transfer this data to a Route Control project.

Solution

The ROUTE_ID and FIXED_ID inputs must both be configured on the RC_IF_ROUTE block route.

RC_IF_ROUTE

#	ROUTE_ID (r)	FIXED_ID (f)	Comments
A	0	0	The route ID has not been assigned; this route is using a dynamically determined route ID during runtime. Therefore, the range of route IDs for this AS must be manually increased in the RC engineering tool or several routes will share a common ID. Note: If you configure a route block 1 with this combination, the AS must have at least one other route block 2 with a configured combination as specified in Case B. The first route block 1 then shares the route ID with route block 2.
B	1..300	0	The configured ID is reserved for the dynamic ID range. The ID assignment shown is only an example, and this route can contain a different dynamic ID during runtime. Advantage over Case A: The dynamic ID range is defined in the S7 project, and therefore, no additional settings are required in Route Control engineering. Notes: Dynamic route IDs must also fall within the range of 1 to 300. Route IDs do not have to be assigned consecutively. Gaps are allowed (for example, in reserve for future routes).
C	0	1	Error: When a fixed ID is specified, then a number between 1 and 300 must also be configured! However, the Route Control Wizard will attempt to correct the error and will propose the next available ID. If no more IDs are available (if all 300 IDs have been assigned), then the wizard cannot correct the error, and this route can be used during runtime only by sharing an ID with another route.
D	1..300	1	This ID is fixed. The Route Control Wizard checks whether an ID might have been assigned twice. Note: Route IDs do not have to be assigned consecutively. Gaps are allowed (for example, in reserve for future routes).

Note

If you do not want to perform more than 300 simultaneous material transports during runtime, you can assign all route IDs as fixed IDs. In this case, the IDs must be fixed in the configuration of all RC_IF_ROUTE blocks, and the FIXED_ID input must be set to 1.

Example

You have two automation systems, AS1 and AS2:

AS	Routes with Fixed Route ID	Routes with Dynamic Route ID
1	2	3
2	0	4

This means that AS1 is working with two fixed and three dynamic routes, enabling a total of five material transports to take place simultaneously. By contrast, AS2 is using four dynamic route IDs and no fixed IDs, enabling a maximum of four material transports to take place simultaneously.

Specifications:

- AS1: The first route always operates with route ID 1 during runtime
- AS1: The second route always operates with route ID 2 during runtime
- AS1: The other three route blocks share route IDs 3 to 5 during runtime
- AS2: All four route blocks share route IDs 10 to 13 during runtime

Suggested distribution of route IDs:

AS	Fixed Route IDs	Dynamic Route IDs
1	1,2	3, 4, 5
2	---	10, 11, 12, 13

The RC_IF_ROUTE blocks (9 material transports) must now be configured as follows:

AS \ Route block \ Parameter	1	2	3	4	5	6	7	8	9
1 \ RC_IF_ROUTE.ROUTE_ID	1	2	3	4	5	-	-	-	-
1 \ RC_IF_ROUTE.FIXED_ID	1	1	0	0	0	-	-	-	-
2 \ RC_IF_ROUTE.ROUTE_ID	-	-	-	-	-	10	11	12	13
2 \ RC_IF_ROUTE.FIXED_ID	-	-	-	-	-	0	0	0	0

Check List

- You have specified the relevant automation systems for Route Control.
- You know the maximum number of material transports that can take place simultaneously during runtime.
- You have allocated material transports to automation systems, for example, to ensure an even load.
- You have specified which routes should work with fixed IDs and which routes should work with dynamic IDs. Note: Simultaneous routes should have fixed IDs. Routes that do not occur simultaneously can share an ID. However, this is not necessary if enough IDs are available for fixed assignment, for example, fewer than 300 simultaneous material transports.
- You have inserted RC_IF_ROUTE blocks in CFC charts and have assigned the appropriate ROUTE_ID or FIXED_ID input parameters as required.
- You have used the Route Control Wizard to transfer the IDs, ranges, and automation system allocation to the Route Control engineering project.
- During runtime, these specifications will be downloaded from the RC server to the automation system, and the automation system can then use this information to search for an available ID, if necessary.

6.5.3 Guide: Exporting from an S7 Project to a Route Control Project

User Task

Data and objects already contained in an S7 project should be transferred to the Route Control project. This prevents duplicate project engineering effort as well as inconsistent data.

Solution

You will find the dialogs for each step of the Route Control Wizard in

Route Control Wizard: Selection of Actions

Example

See Route Control Wizard.

Check List

1. Prepare the hardware (automation system in HW Config and WinCC OS)
2. Prepare (plant hierarchy, insertion, block configuration) the CFC charts: routes and elements
3. Call and run the Route Control Wizard and make option selections
4. The selected actions are carried out
5. Check the results (in the log file)

6.5.4 Guide: Exporting a Connection Configuration (NetPro)

User Task

You would like to have automatic configuration of the cross-coupling communication connections between automation systems in which Route Control blocks are operating (assignment of a communication ID).

Solution

The Route Control Wizard performs this task and should be called any time changes affecting Route Control cross-coupling are made in the project. This includes:

- Addition or removal of a relevant automation system for Route Control

---

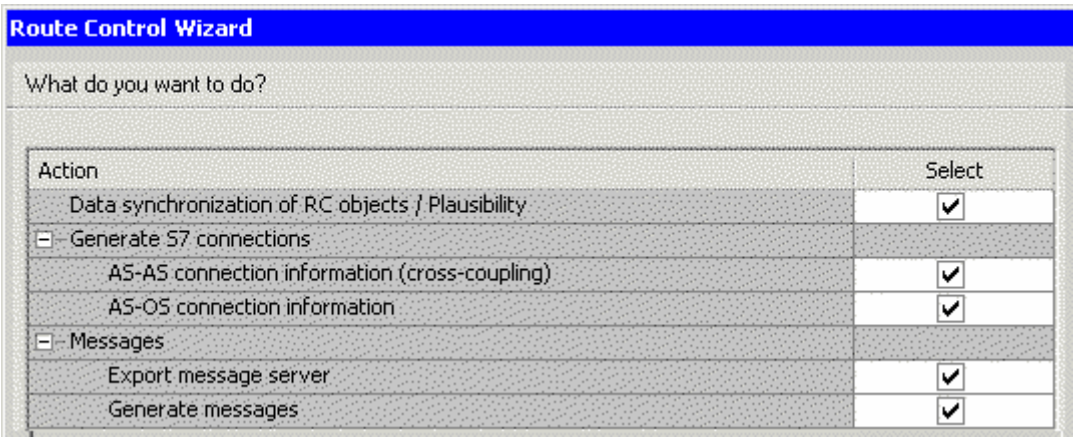
Note

Because a restart is required if the communication ID is changed after the communication connections are downloaded to the automation system, you must perform the following steps:

- Insert (or remove) a new automation system in (from) the S7 project.
- Call the Route Control Wizard and assign or correct the communication IDs (this changes the NetPro settings).
- Export the data from the S7 project and import them into the RC engineering project.
- Load the database onto the Route Control server and restart the server. This will make the new IDs known to the instances that use them.
- Download the connections from NetPro to the automation system.
- Restart the automation system (this is a general requirement any time changes are made to NetPro settings and is not a requirement for Route Control)

Example

Start the Route Control Wizard and select "Generate S7 Connection \ Cross-Coupling Information" in the selection dialog if you have added new automation systems or removed automation systems from your S7 project.



Otherwise, clear this selection.

Note

If only the properties of an automation system, for example, a MAC or TCP/IP address, are changed, then the S7 connections do not have to be regenerated, and this selection can be cleared for the next synchronization.

The MAC or TCP/IP address is transferred to the Route Control engineering project in the "Synchronize RC Objects" item.

Check List

- Check to determine whether the cross-coupling connections need to be exported.
- You have added or removed automation systems.
- For any added automation systems, you have set properties such as MAC or TCP/IP address.
- You call the Route Control Wizard and select "Synchronize RC Objects" and, if necessary, "Generate S7 Connections \ Cross-Coupling Information."

6.6 Configuring the Route Control Project

6.6.1 Guide: Route Control Project

User Task

You wish to obtain an overview of the Route Control project engineering environment.

Solution

You can start the Route Control project engineering either in SIMATIC Manager using the **Options > Route Control > Project Engineering** menu command or using the Windows Start menu: **Start > SIMATIC > Route Control > Project Engineering**. The advantage of using SIMATIC Manager is that it provides a familiar project context, thus enabling you to open the correct Route Control project database. If, however, you open the project engineering environment using the Windows Start menu, you must first create a project context in which the S7 project can be opened (using the File > Open command).

The project engineering interface is divided into two areas:

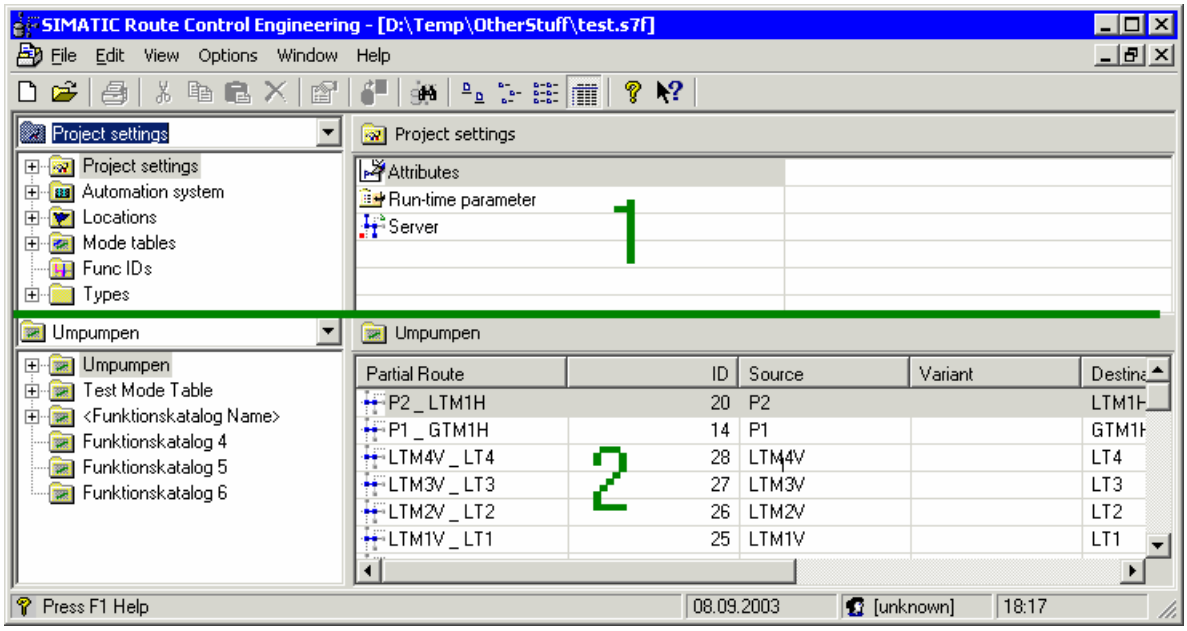
- Plant objects (automation system, elements, locations, Route Control server, etc.) on top
- Partial routes (with source and destination), mode levels, and interconnected elements on the bottom

You (the user) must configure a number of objects:

- RC server *
- Definition of locations that could be the source, destination, or via location for a material transport. General locations and plant-related locations (process cell/unit) can be configured.
- Automation systems and elements * (control, sensor, parameter, and linking elements)
- Assignment of master routes to the automation systems
- Definition of mode tables. A mode table is a group of mode levels to which elements interconnected to partial routes can be assigned.
- Partial routes with an indication of their beginning and end (locations) and assignment of elements
- Materials, material groups, and permitted material sequences

* These objects can be transferred from an S7 project to avoid duplicate project engineering effort.

Example



The upper area (1) contains the process cell objects and the elements that you interconnect in partial routes. The lower area (2) displays the mode tables, partial routes, and inserted elements.

Check List

- You are familiar with the tasks that must be performed in a Route Control project.
- You know which objects can be transferred from an S7 project to avoid duplicate project engineering effort.

6.6.2 Guide: Configuring the RC Server (Redundant)

User Task

To ensure availability, you would like to configure the Route Control as a redundant system (with two computers).

Solution

- Install a Route Control server on this computer.
- Share a directory so that the Route Control project engineering of an engineering station can be copied to the server (share is automatically created by the Route Control Server setup).
- Configure two servers (RC applications) in your Route Control project.
- Load the project engineering onto the Route Control master server.

Example

Check List

- The Route Control server has been installed (on both computers)
- The <Drive>:\Siemens\RCS\Load directory is shared as RC_LOAD (Server 1 = master server)

6.6.3 Guide: Configuring the RC Server (Standalone)

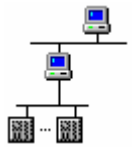
User Task

You would like to configure two computers currently installed with the Windows operating system as Route Control servers.

Solution

- Install a Route Control server on this computer.
- Share out a directory so that the Route Control project engineering can be copied to the server from an engineering station.
- In the server dialog of the Route Control Wizard, specify two servers (Route Control applications). These servers will now be included in your Route Control project. Be sure to indicate whether the computers have one or two network cards.
- Load the project engineering onto the Route Control master server.

Example



Check List

- The Route Control server has been installed.
- The <Drive>:\Siemens\RCS\Load is shared out.

6.6.4 Guide: 'Offline' Route Search

User Task

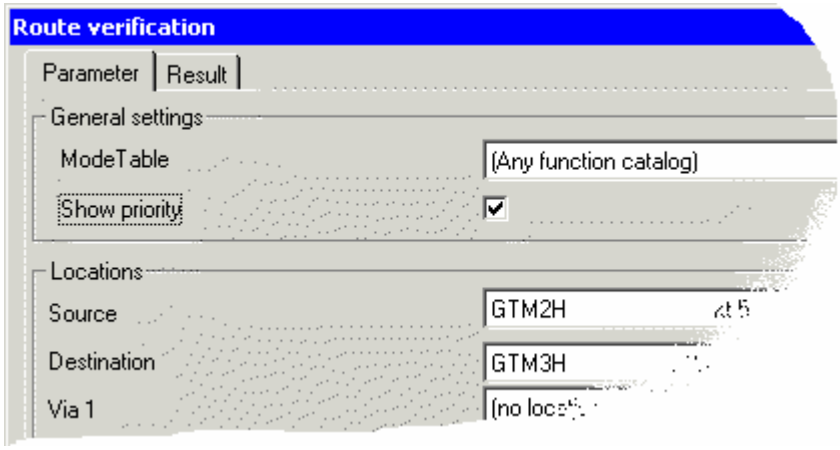
You have configured your network into partial routes and would like to check the route network for correctness before loading it onto the Route Control server and thus enabling it (route check).

Solution

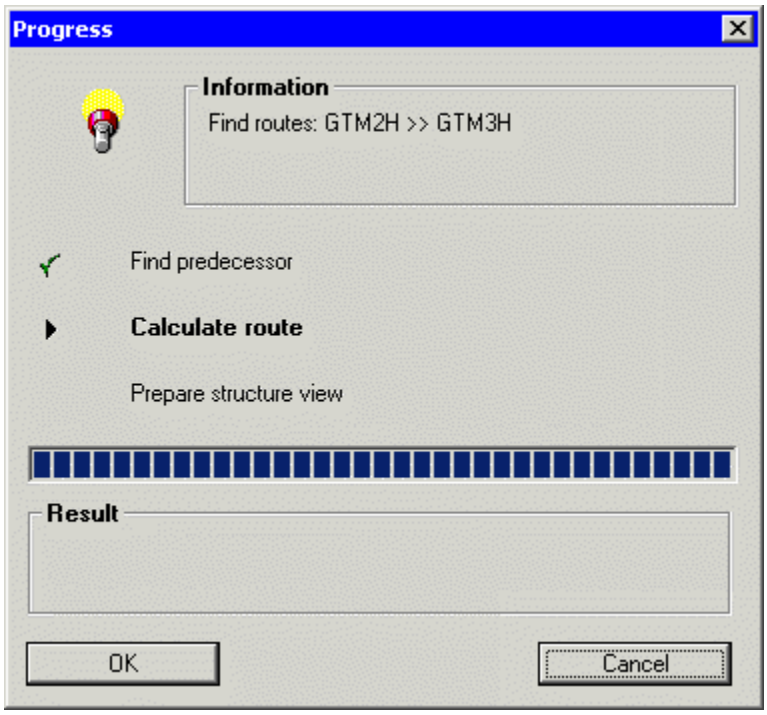
The Route Control engineering tool has a "Check Route" function, which can be started using the *Options / Check Route* menu command or by pressing this button:

Example

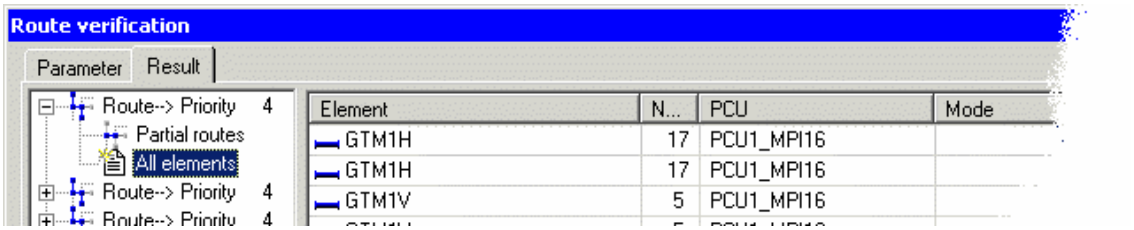
Select the search parameters (source, destination, etc.)



Start the search:



Search results:



Check List

1. You have configured partial routes.
2. You have started the route search tool and are now checking various source and destination combinations.
3. The tool displays all of the routes and partial routes that have been found.
4. You check whether the correct partial routes have been found and correct your project engineering as necessary.

6.6.5 Guide: Cross-Reference List of Elements

User Task

You would like to find out which partial routes contain a particular element, that is, where the element is being used.

Solution

The shortcut menu of an element (in the top or bottom window of the Route Control project engineering interface) contains a function called "Cross-Reference List." Open the dialog to obtain a list of all partial routes that contain this element. Select a partial route, and switch to the "Elements" tab to view a list of all the elements in this partial route.

Example

Check List

1. You know how to display a list of all partial routes that contain a particular element (in the shortcut menu for the element of the automation system or for the interconnected element)
2. You can also determine which other elements are interconnected in a partial routes (by selecting the partial route and then the second "Elements" tab)

6.7 Guide CSV Interface

6.7.1 Guide: CSV Interface

User Task

You would like an efficient method, such as MS Excel, for configuring locations, partial routes, and interconnected elements.

Solution

1. Export the objects from the Route Control project engineering to a CSV file.
2. Modify and add to the list.
3. Import the new list from a CSV file to the Route Control project engineering.

Example

For a description of the dialogs and the structure of the various CSV files, refer to Interfaces: CSV File (Overview) in the appendix.

Check List

Follow the steps described in Interfaces:CSV File (Overview).

6.7.2 CSV Interface (Export Log)

File Name

RC_EXPORT_CSV.LOG

File Location

The log file is stored in the same path where the Route Control project database is located. See Storage of Route Control Project.

File Segments

Transfer log:

- Global information
- S7 project name: Name of S7 project containing the Route Control project
- S7 project path: Path to the S7 project
- RC project name: Name of Route Control project (database file name)
- RC project path: Path to the Route Control project
- User: User who initiated the export operation
- Transfer date: Time stamp indicating the date of the export

Options:

- Settings selected by the user
- CSV storage directory: Path where the export CSV files are stored
- Direction of data exchange: Whether data are to be exported (written to CSV file) or imported (read from CSV file) is indicated here; in this case: Export

Data synchronization: (CE - control elements):

- Number of exported objects

For other objects (SE, PE, LE, mode table, locations, partial routes, all partial routes with interconnected elements, one partial route with interconnected elements), the number of exported elements will also be indicated in the same way as for control elements.

6.7.3 CSV Interface (Import Log)

File Name

RC_IMPORT_CSV.LOG

File Location

The log file is stored in the same path where the Route Control project database is located. See Storage of Route Control Project.

File Segments

Transfer log:

- Global information
- S7 project name: Name of S7 project containing the Route Control project
- S7 project path: Path to the S7 project
- RC project name: Name of Route Control project (database file name)
- RC project path: Path to the Route Control project
- User: User who initiated the export operation
- Transfer date: Time stamp indicating the date of the export

Options:

- Settings selected by the user
- CSV storage directory: Path where the export CSV files are stored
- Direction of data exchange: Whether data are to be exported (written to CSV file) or imported (read from CSV file) is indicated here; in this case: Import

Data synchronization: (CE - control elements):

- Name of imported objects and information indicating whether they were updated only or recreated

For other objects (SE, PE, LE, mode table, locations, partial routes, all partial routes with interconnected elements, one partial route with interconnected elements), the number of exported elements will also be indicated in the same way as for control elements.

Number of transferred objects:

- Final information on the total number of imported elements

Compressed database:

- Information on the file size before and after compression, which is always initiated automatically

6.8 Route Control SFC

6.8.1 SFC: Overview

For a quick overview of how an SFC block is inserted, see SFC: Schematic. Follow each step to adapt the sample SFC to your requirements and use it in your own project:

1. Copy the sample SFC from the Route Control library in your own S7 project
2. Modify this copy according to your requirements to create your own sample SFC.
3. Now create as many copies of your sample SFC as you need (in general, one SFC per RC_IF_ROUTE).
4. Interconnect these SFC instances with the RC_IF_ROUTE blocks in each CFC chart as shown in SFC: Schematic.

Note

If an SFC package is not installed on the computer and you open the Route Control library, an error message will appear.

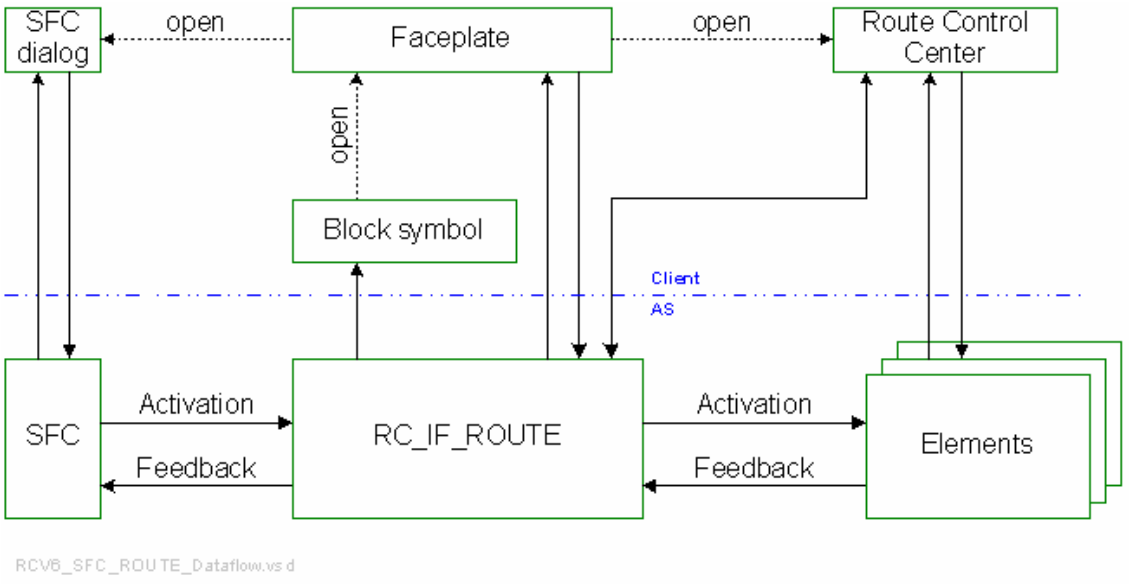
This is because the Route Control library contains an SFC block (SFC typical).

For an overview of the relationships between an SFC, a route, and operator dialogs, refer to Guide: Relationship between SFC and Route, Including Operator Dialogs

The SFC block provided by the Route Control library (RC_IF_SFC) is intended as a sample to be copied and modified according to individual requirements. In particular, steps to activate mode levels (or stepping conditions that request values) should be removed from the chains if these mode levels are not used for the material transport.

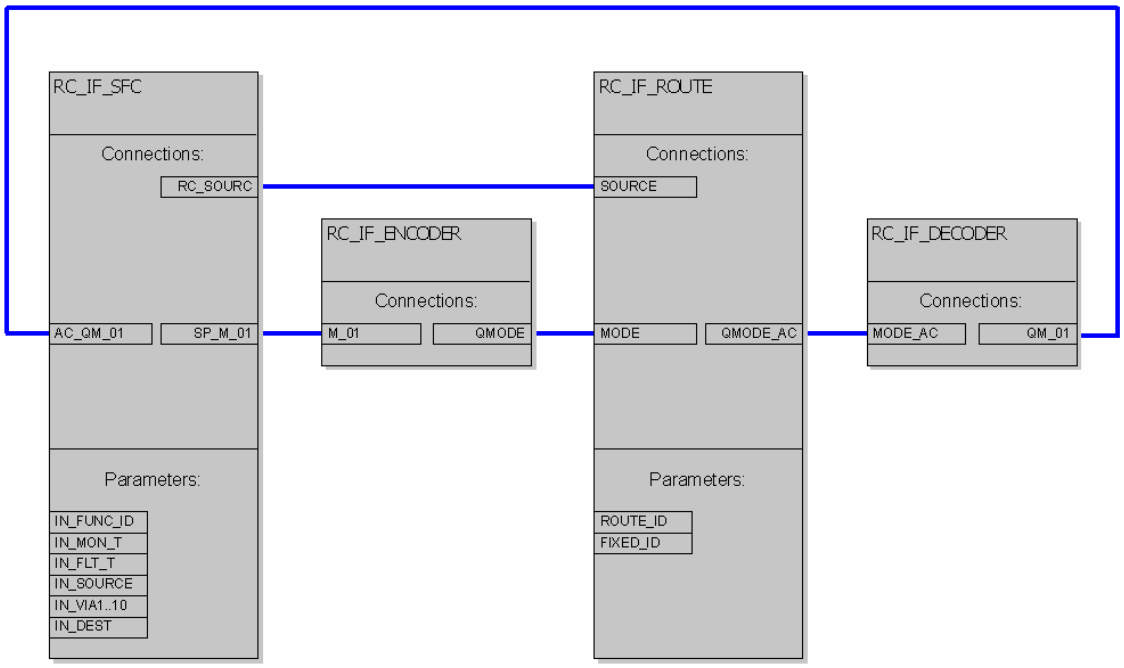
6.8.2 Guide: Relationship between SFC and Route, Including Operator Dialogs

The following figure illustrates the interaction between an SFC block, a route block, and the operator control and display dialogs.



6.8.3 SFC: Schematic

The SFC block is used to activate a route. Along with the RC_IF_ENCODER and RC_IF_DECODER auxiliary blocks, the following figure shows the principle connections. For the complete interconnection, which is automatically generated by the SFC dialog as soon as you have configured the necessary connections in CFC, refer to SFC: Complete Interconnection.



6.8.4 SFC: Start Conditions for Holding

Starting Point

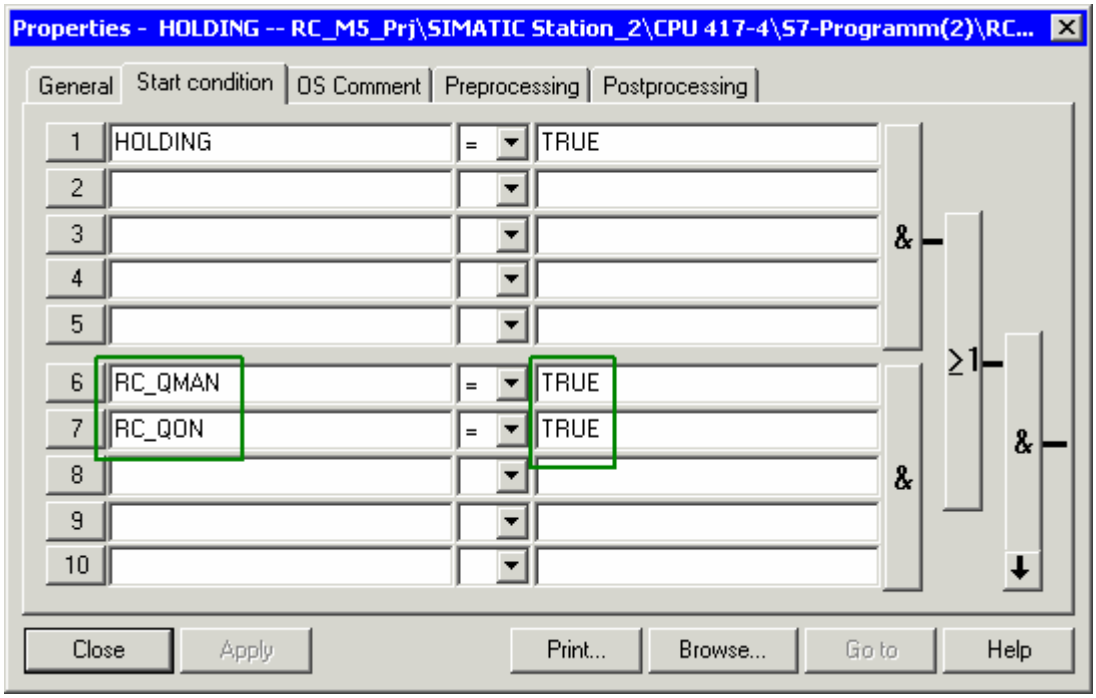
A route can be switched to manual mode through the Route Control Center. In this case, the signals of the automatic mode, i.e., of the SFC block, are no longer evaluated until the user switches back to automatic mode.

The automatic mode (SFC) would remain in *Running* mode, however, which could result in an error. For this reason, Route Control offers the option of switching to *Holding* mode in such a case.

Solution

a) The *Holding* branch of the SFC block evaluates the signals RC_QMAN and RC_QON. RC_QMAN means that the route is being controlled manually, and RC_QON indicates that the route is actually running. The SFC switches to *Holding* whenever a running route is controlled manually.

b) The *Holding tab* must be positioned to the left of the *Running tab*, so that it has a higher priority and can take over from the *Running branch*.



6.8.5 SFC: Mode Levels

The mode levels for material transports must be aligned for the following elements:

1. SFC block that activates the route (program in the SFC)
2. SFC block and route block (interconnection in CFC)
3. Mode table and mode levels in the Route Control engineering project

6.8.6 SFC: S88 Status

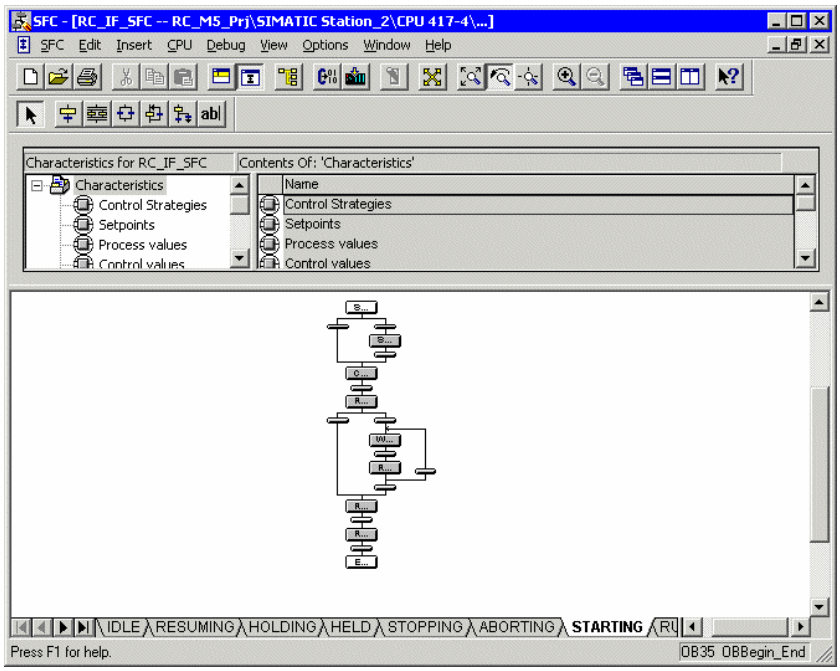
S88 statuses can be seen as individual tabs in the SFC block:

For a status transition diagram, go to RC Faceplate / Route Status.

Note

With respect to the route, the STOPPING, ABORTING, and COMPLETING statuses are handled in the same way by the SFC. In each case, the route is terminated.

6.8.7 SFC: SFC Editor



6.8.8 SFC: Complete Interconnection

Refer to the sample chart in the Route Control library.

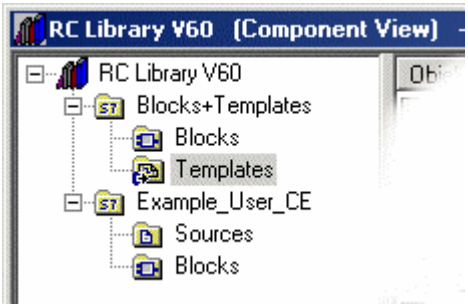
6.9 Route Control CFC Examples

6.9.1 Guide: CFC Overview, Examples

Templates

- Guide: CFC Configuring One Automation System (RC_IF_CFG)
- Guide: CFC Configuring One of Multiple Automation Systems (RC_IF_CFG + RC_IF_XC_DIAG + RC_IF_XC_LIFE)
- Guide: CFC Control Element
- Guide: CFC Dual-State Motor (RC_IF_MOTOR + MOTOR)
- Guide: CFC Dual-State Motor with No Feedback (RC_IF_MOTOR + MOTOR)
- Guide: CFC Motor with Interlocking Module (RC_IF_MOTOR + MOTOR + ILOCK)
- Guide: CFC Dual-Speed Motor (RC_IF_MOT_SPED + MOT_SPED)
- Guide: CFC Bi-Directional Motor (RC_IF_MOT_REV + MOT_REV)
- Guide: CFC Valve with Dual Feedback Signals (RC_IF_VALVE + VALVE)
- Guide: CFC Valve with Interlocking Module (RC_IF_VALVE + VALVE + ILOCK)
- Guide: CFC Valve with Feedback (RC_IF_VALVE + VALVE)
- Guide: CFC Valve with No Feedback Signal (RC_IF_VALVE + VALVE)
- Guide: CFC Motor Valve (RC_IF_VAL_MOT + VAL_MOT)
- Guideline: CFC for Sensor Element
- Guide: CFC Sensor, Binary (RC_IF_SENSOR)
- Guide: CFC Conductivity (RC_IF_CONDUCT)
- Guide: CFC Parameter Element (RC_IF_TIMER)
- Guide: CFC Linking Element (RC_IF_LE)
- Guide: CFC Route (RC_IF_ROUTE)
- Guide: CFC Charts

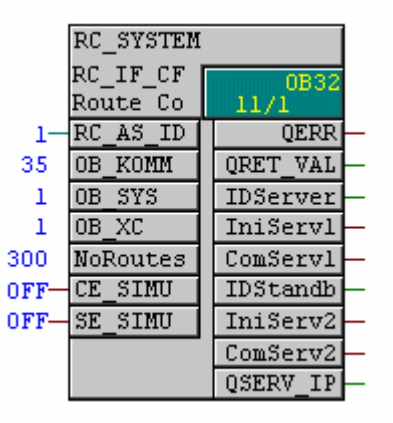
You can find the SIMATIC Route Control interface blocks used in the examples under *User Interface Blocks* in the Route Control library:



6.10 Configuration

6.10.1 Guide: CFC Configuring One Automation System

CFC Chart

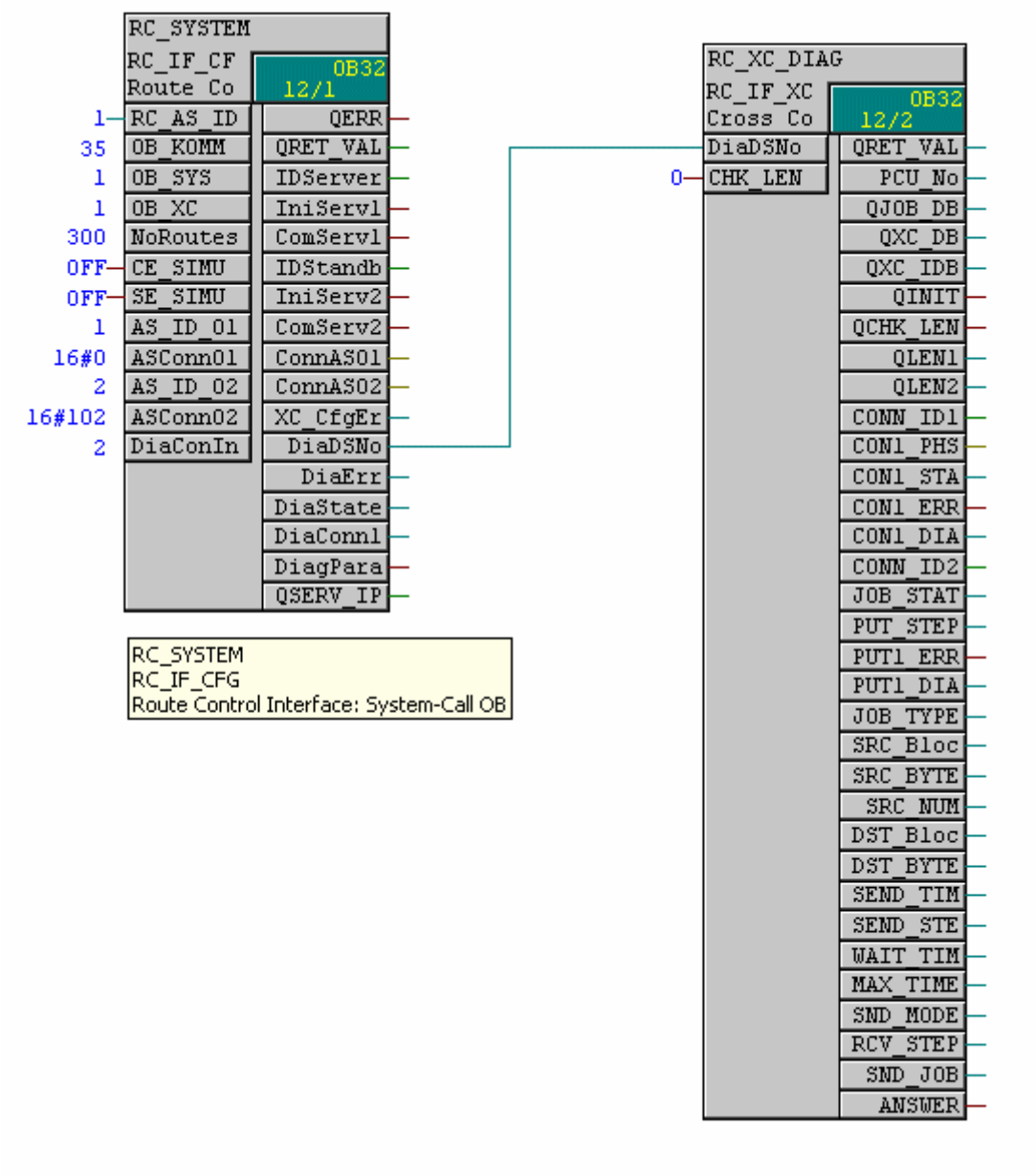


Description of Block

RC_IF_CFG (FB850)

6.10.2 Guide: CFC Configuring One of Multiple Automation Systems

CFC Chart



Description of Blocks

RC_IF_CFG (FB850)

RC_IF_XC_DIAG (FB884)

6.11 Route

6.11.1 Guide: CFC Route

User Task

You want to insert and configure a route in an S7 project.

Solution

Insert one block of type RC_IF_ROUTE per route (material transport) and configure the parameters.

Adjust the parameters of RC_IF_CFG as required.

Insert a user block in the CFC. This user block can be developed based on an SFC typical supplied by Route Control; see SFC: Overview..

Related Topics

Guide: Dynamic ID Assignment

Example

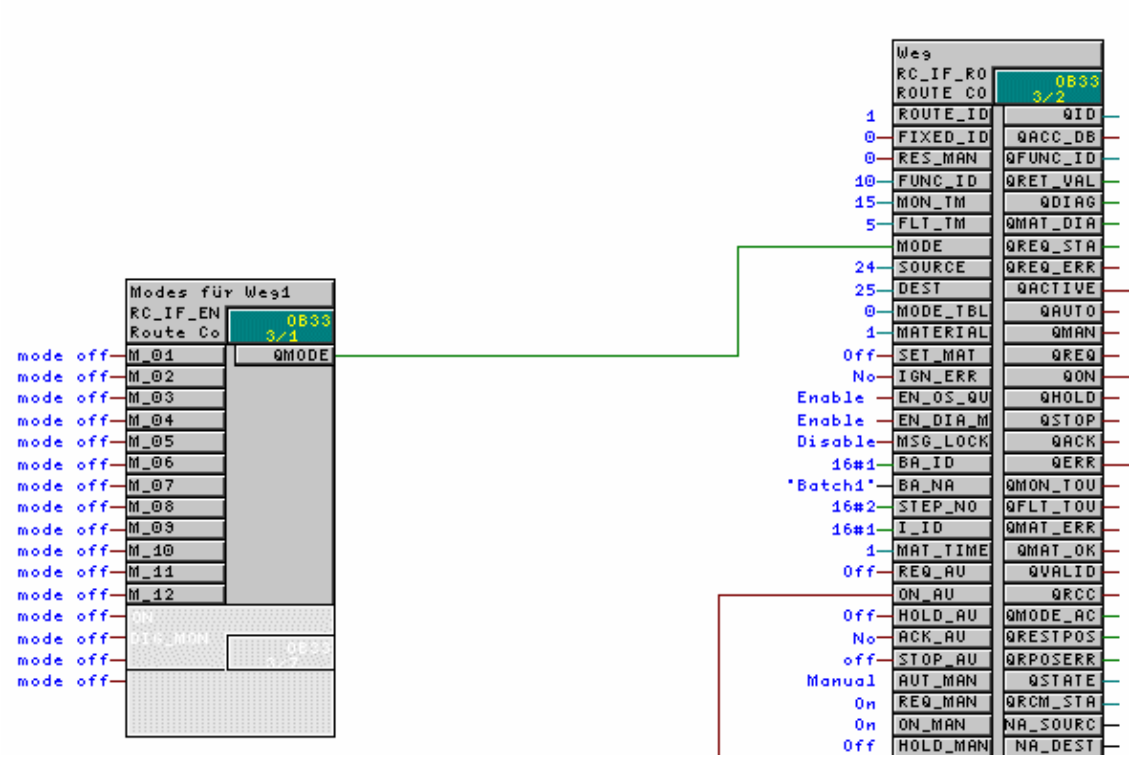
See SFC: Schematic

Check List

1. The CFC chart has been created.
2. The RC_IF_ROUTE block is inserted.
3. An ID has been configured (or assigned by the Route Control Wizard).
4. Parameters have been configured for fixed or dynamic ID assignment.
5. The *No Routes* parameter in RC_IF_CFG has been adjusted (to equal the highest assigned ID in the RC_IF_ROUTE blocks).
6. RC_IF_ROUTE has been interconnected with the user program.
7. Routes have been incorporated in the Route Control project engineering using the Export procedure of the Route Control Wizard.

6.11.2 Guide: CFC Encoder

CFC Chart



Description of Blocks

RC_IF_ROUTE (FB800)

RC_IF_DECODER (FC801)

RC_IF_DECODER (FC801)

6.11.3 Guide: CFC Decoder

Similar to Guide: CFC Encoder but connected downstream (and to the right of) RC_IF_ROUTE and connected with its QMODE output.

6.12 Control Elements

6.12.1 Guide: CFC Control Element

User Task

You would like to control a process-related element such as a MOTOR, a VALVE, or another object from the standard library from Route Control.

The same applies for sensor and parameter elements.

Solution

1. Insert the standard library block in a CFC chart.
2. Now insert the corresponding Route Control interface block in the CFC chart.
3. Connect the corresponding inputs to the corresponding outputs.
4. Export the elements to the Route Control project engineering.
5. Configure partial routes with these elements.
6. Use these elements to control routes.

Examples

Guide: CFC Motor with Interlocking Module

Guide: CFC Dual-Speed Motor

Guide: CFC Bi-Directional Motor

Guide: CFC Dual-Speed Motor

Guide: CFC Dual-Speed Motor with No Feedback

Guide: CFC Valve with Feedback

Guide: CFC Motor Valve

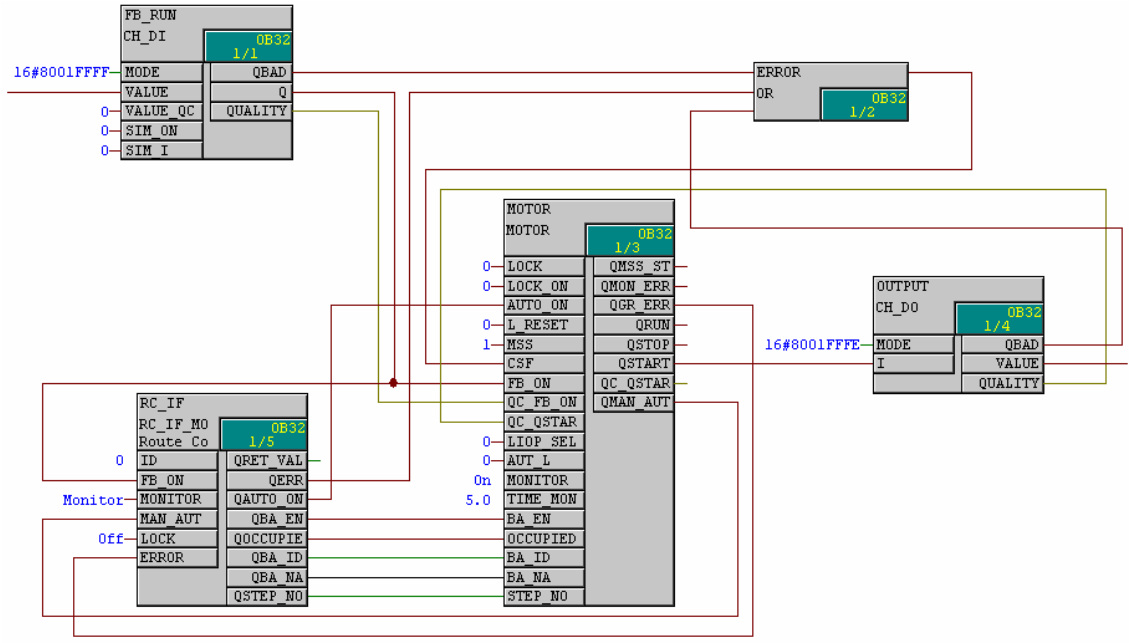
Guide: CFC Valve with Interlocking Module

Guide: CFC Valve with Dual Feedback Signals

Guide: CFC Valve with No Feedback Signal

6.12.2 Guide: CFC Dual-State Motor

CFC Chart

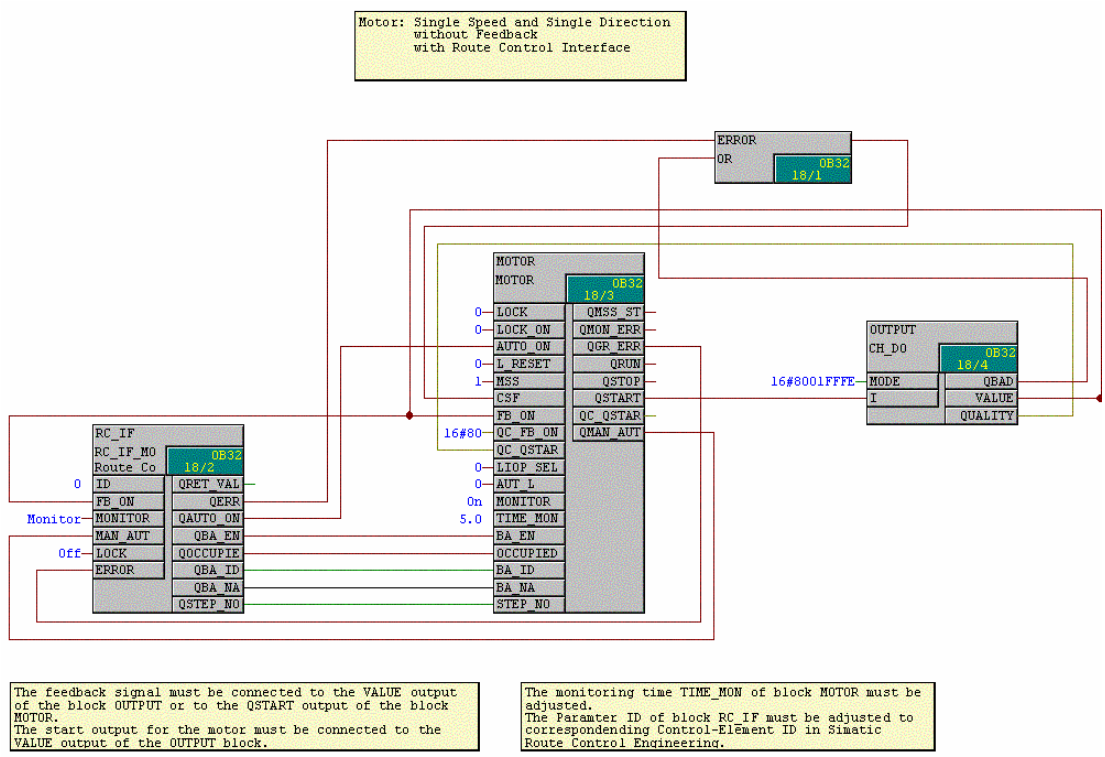


Description of Block

RC_IF_MOTOR (FB822)

6.12.3 Guide: CFC Dual-State Motor with No Feedback

CFC Chart

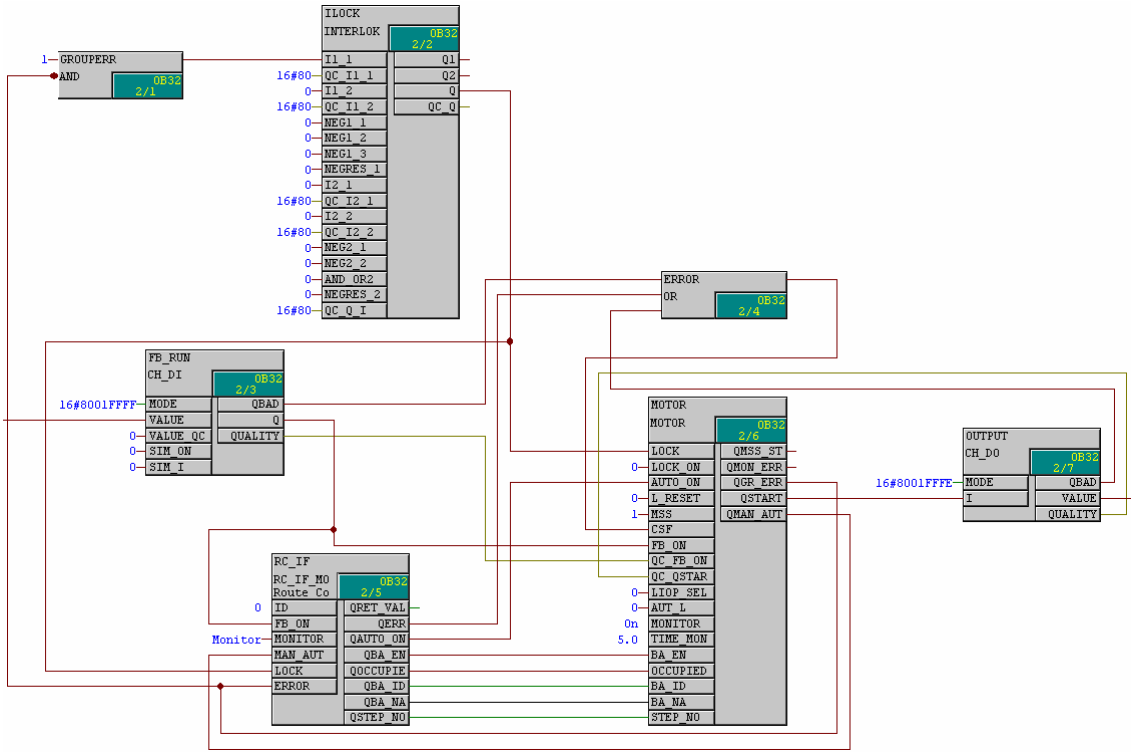


Description of Block

RC_IF_MOTOR (FB822)

6.12.4 Guide: CFC Motor with Interlocking Module

CFC Chart

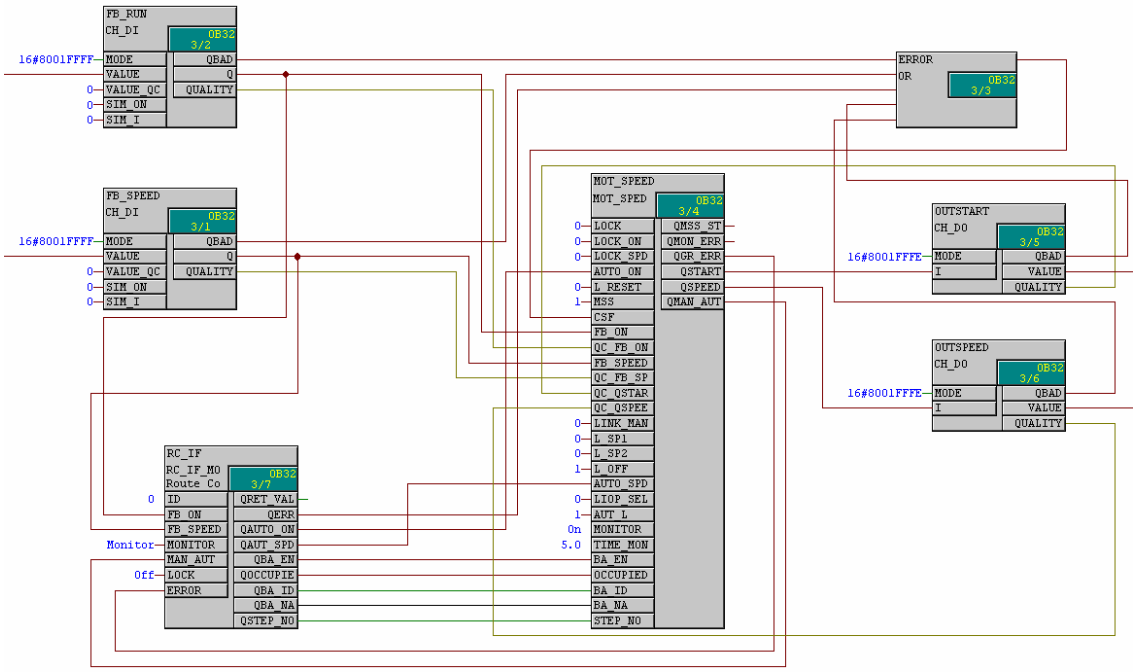


Description of Block

RC_IF_MOTOR (FB822)

6.12.5 Guide: CFC Dual-Speed Motor

CFC Chart

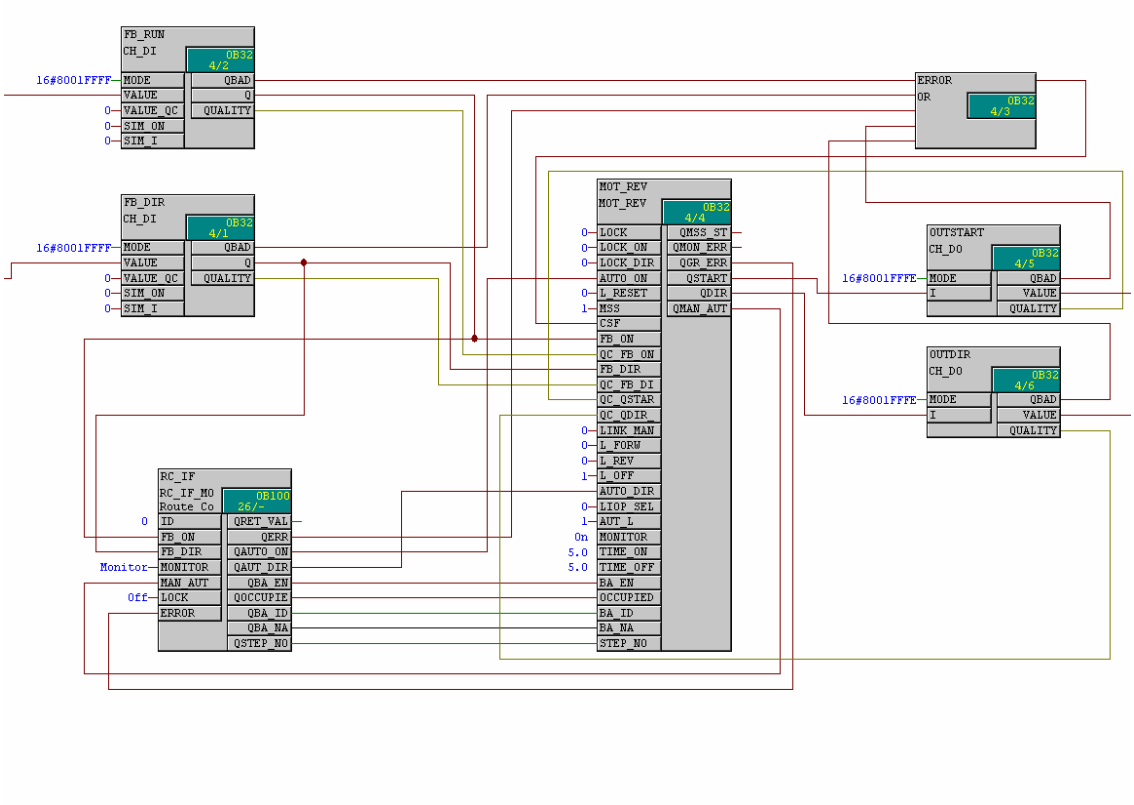


Description of Block

RC_IF_MOT_SPED (FB824)

6.12.6 Guide: CFC Bi-Directional Motor

CFC Chart

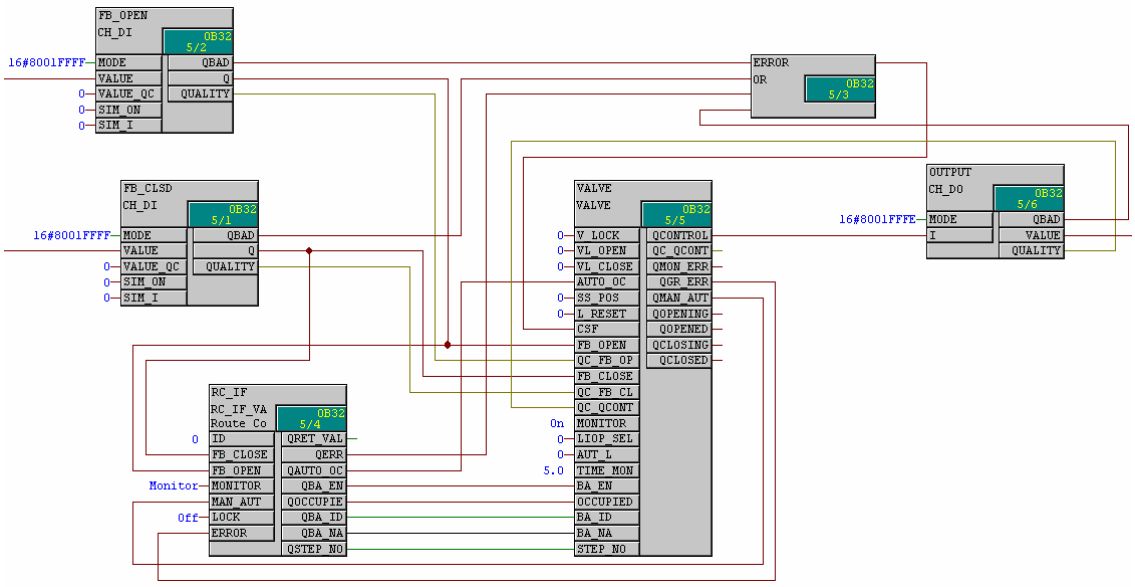


Description of Block

RC_IF_MOT_REV (FB823)

6.12.7 Guide: CFC Valve with Dual Feedback Signals

CFC Chart

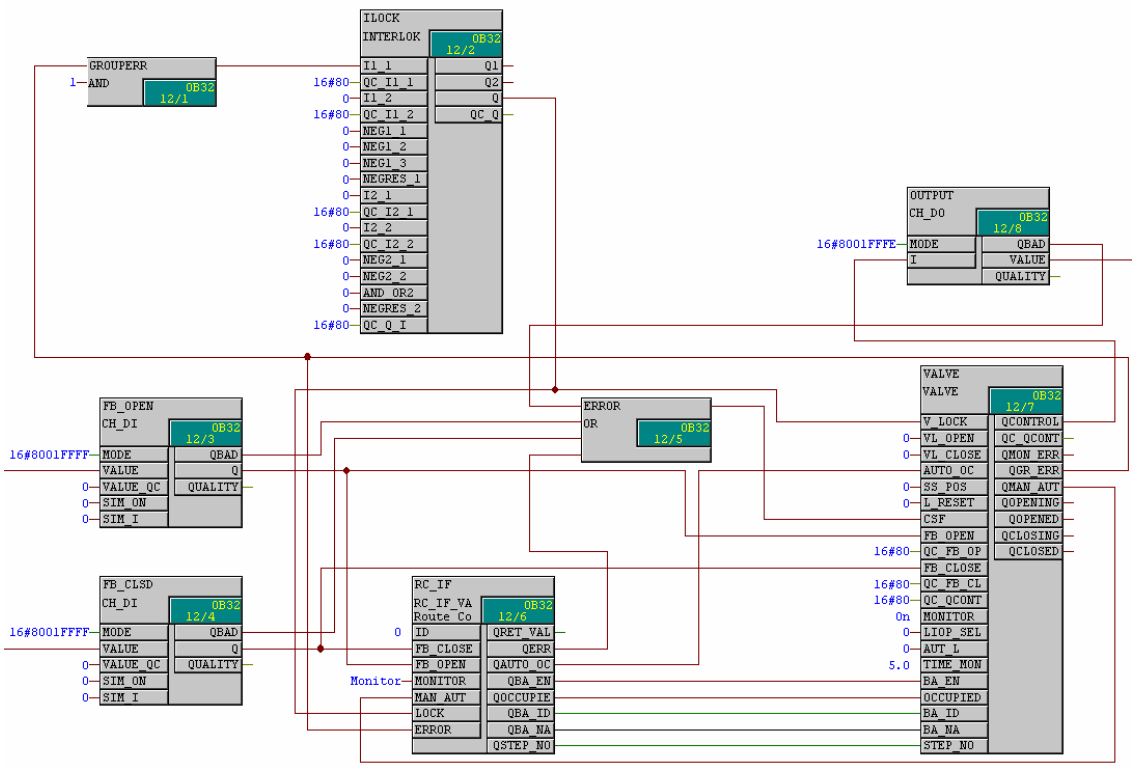


Description of Block

RC_IF_VALVE (FB826)

6.12.8 Guide: CFC Valve with Interlocking Module

CFC Chart

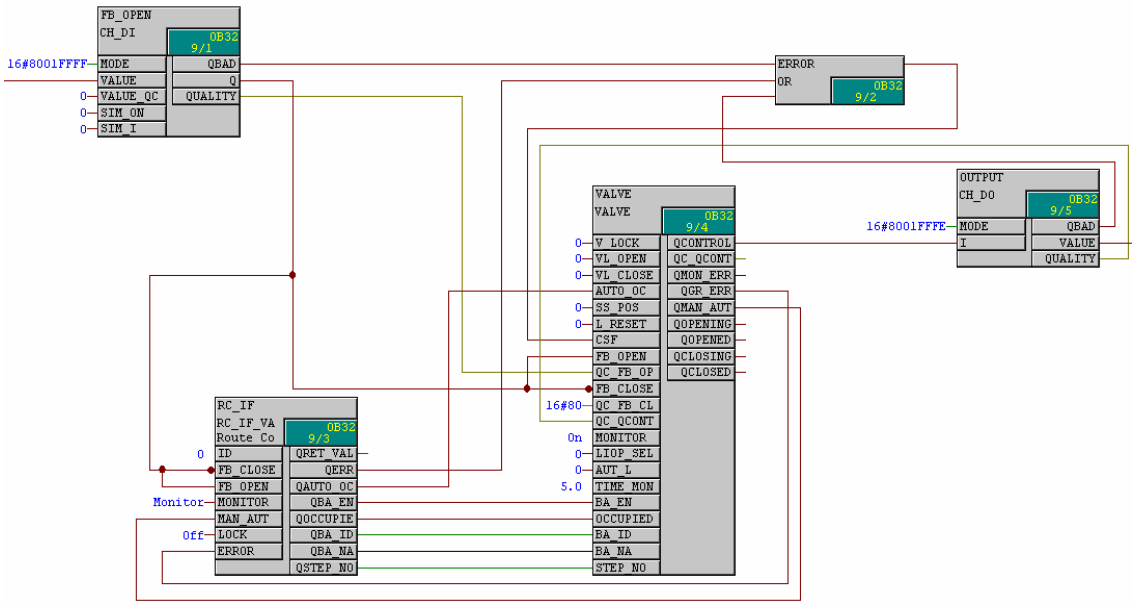


Description of Block

RC_IF_VALVE (FB826)

6.12.9 Guide: CFC Valve with Feedback

CFC Chart

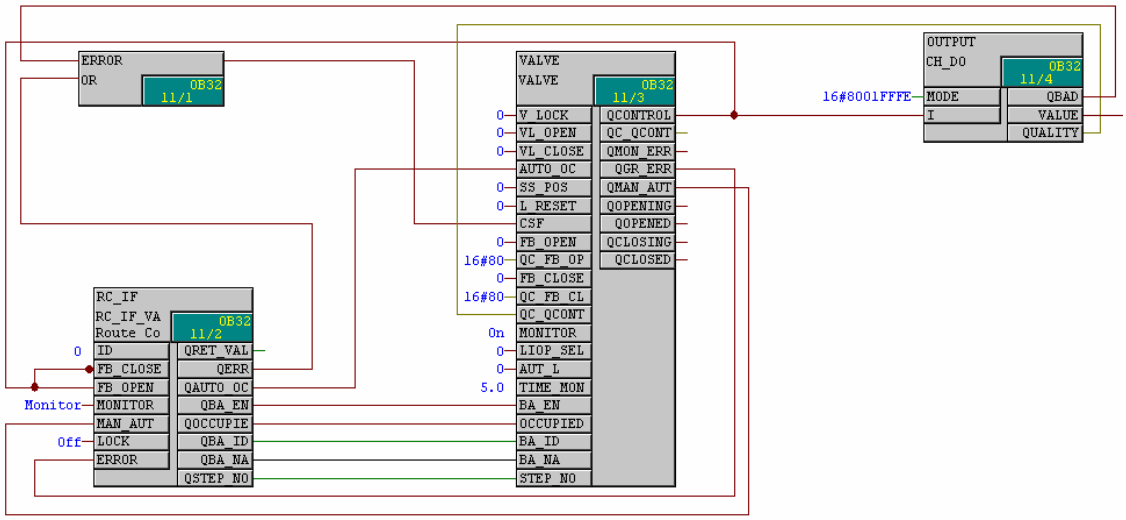


Description of Block

RC_IF_VALVE (FB826)

6.12.10 Guide: CFC Valve with No Feedback Signal

CFC Chart

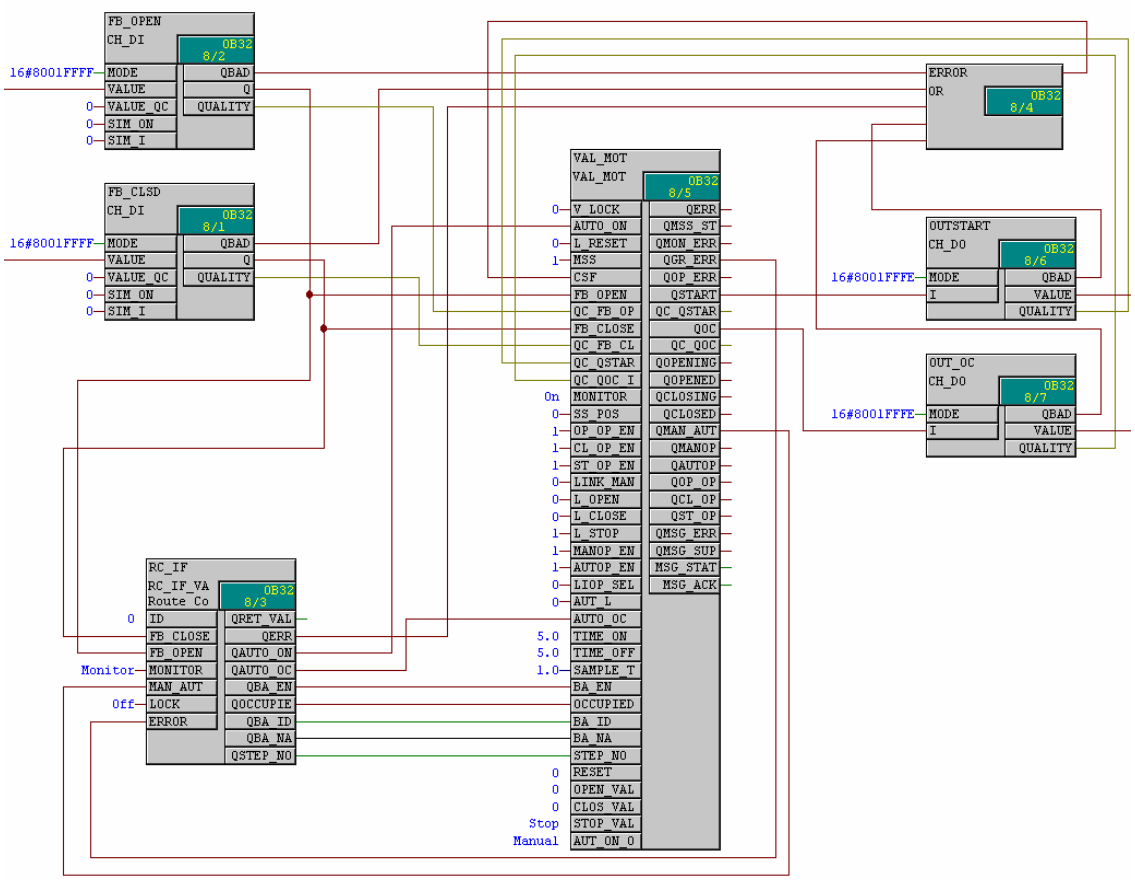


Description of Block

RC_IF_VALVE (FB826)

6.12.11 Guide: CFC Motor Valve

CFC Chart



Description of Block

RC_IF_VAL_MOT (FB825)

6.13 Sensor Elements

6.13.1 Guide: CFC Sensor Element

User Task

You want to evaluate process-related feedback for a liquid level sensor or conductivity sensor in Route Control.

Solution

1. Insert the appropriate Route Control interface block in the CFC chart.
2. Connect the corresponding inputs to the corresponding outputs.
3. Export the elements to the Route Control project engineering.
4. Configure partial routes with these elements.
5. Evaluate these elements indirectly by means of a mode level

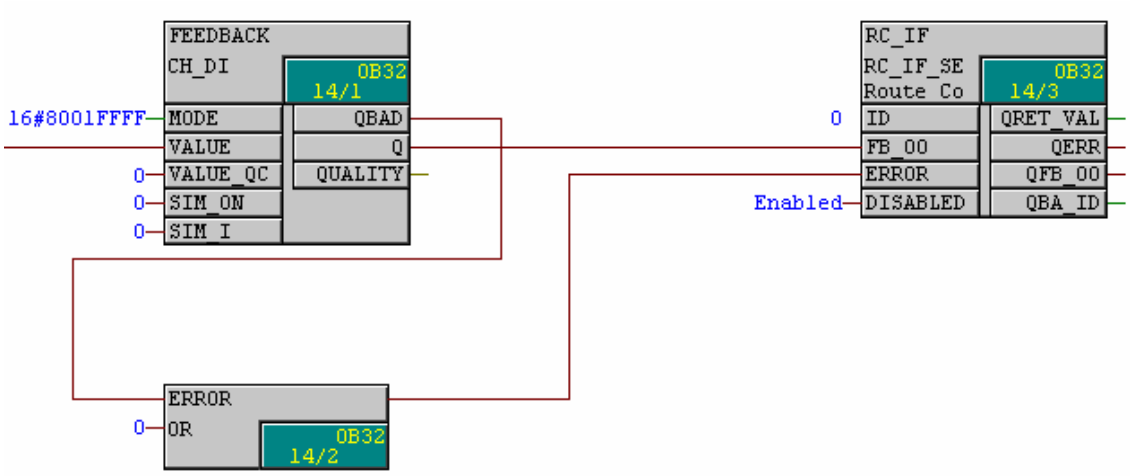
Examples

Guideline: CFC Sensor, Binary

Guide: CFC for Conductivity

6.13.2 Guideline: CFC Sensor, Binary

CFC Chart

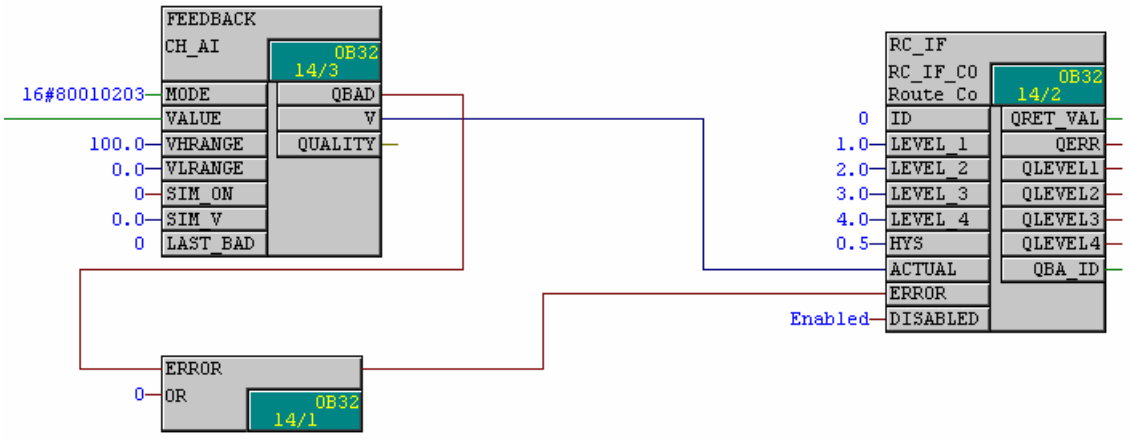


Description of Block

RC_IF_SENSOR (FB845)

6.13.3 Guide: CFC Conductivity

CFC Chart



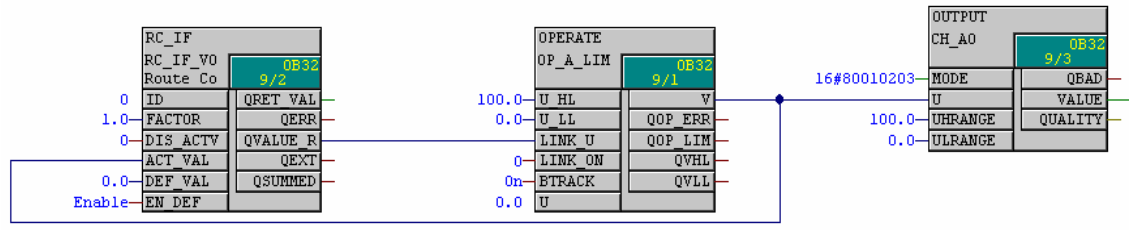
Description of Block

RC_IF_CONDUCT (FB846)

6.14 Parameter Element

6.14.1 Guide: CFC Parameter Element

CFC Chart



Description of Blocks

RC_IF_VOLUME (FC808)

RC_IF_TIMER (FC809)

6.15 Linking Element

6.15.1 Guide: CFC Linking Element

CFC Chart

Description of Block

RC_IF_LE (FB828)

6.16 Route Control Client

6.16.1 Guide: Route Control Faceplate for WinCC

User Task

You want to interconnect the block icon and a route faceplate to a route block to display information about the route in a WinCC picture during runtime.

Requirement

You have already created a CFC chart with an RC_IF_ROUTE block and performed the AS-OS transfer to a WinCC OS project, so that the tags are available.

Solution

Installation of the Route Control engineering component provided a block icon and Route Control faceplate wizard, which can now be used as a normal wizard in WinCC. Copy the block icon to your own WinCC picture and start the Route Control Wizard; you will now be guided through a number of dialogs to interconnect the block icon to an instance of block type RC_IF_ROUTE.

You also have the option of defining an SFC chart name in the SFC_PATH parameter. This should be the name of the SFC chart that controls this route. In this way, you can open an SFC dialog indicating the current SFC status from the RC faceplate during runtime. This is especially useful for diagnostic purposes.

Note

The elements and their interface blocks do not have their own faceplates for WinCC because the process-related elements, for example, from the standard library, already contain such faceplates. For diagnostic purposes, you have the Route Control Center and the online view of the CFC editor.

Example

See Dialogs and Route Control: WinCC Wizard (Selecting an Instance).

Check List

- You have placed the block icon and interconnected it to a route (RC_IF_ROUTE)
- You have correctly supplied the SFC_PATH parameter

6.16.2 Guide: Operator Control & Monitoring

User Task

You would like to learn about the most important interfaces for diagnostics and operator control.

Solution

In WinCC:

- Route Control: WinCC Wizard (Instance Selection)
- RC Block Icon for a Route

Route Control client:

- Route Control Center
- Route Control Messages, OS
- Route Control Messages, AS

SIMATIC Manager/CFC:

- RC_IF_CFG (FB850)
- RC_IF_XC_DIAG (FB884)
- RC_IF_XC_LIFE (FC884)
- RC_IF_ROUTE (FB800)
- RC_IF_MOTOR (FB822) (and all other element blocks)

Route Control server:

- Diagnostics for RC Server

6.17 NetPro Examples

6.17.1 Guide: Configuring NetPro, Overview

General

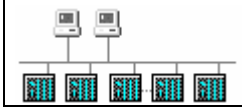
Note

The Route Control Wizard enters the connections required for Route Control and ensures that connection ID assignments are consistent and explicit to save you (the user) from having to enter these connections yourself.

Below are a few examples you can use to check entries made by the wizard.

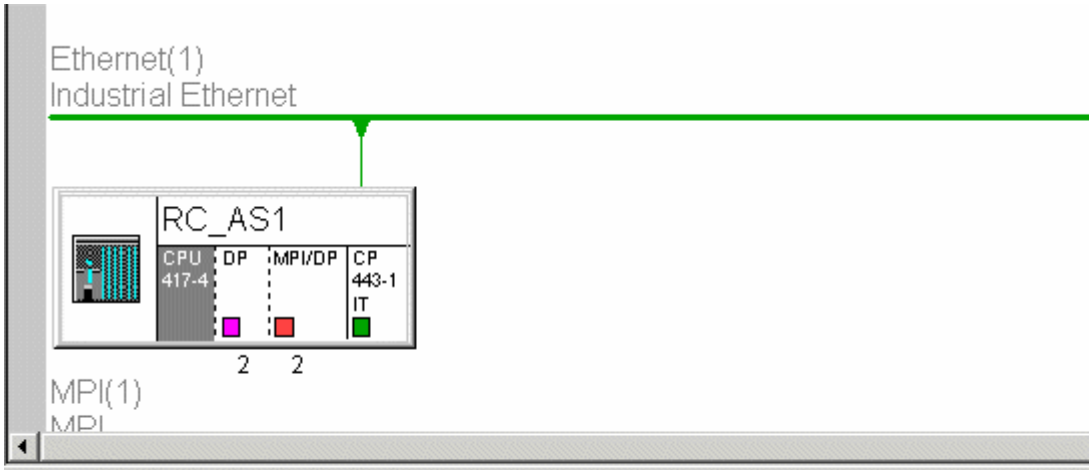
If you make any changes to NetPro (i.e., for non-Route-Control-related automation systems), you must rerun the Route Control Wizard afterward to check for consistency.

In general, when configuring NetPro you must take into account whether Route Control is operating with only one automation system or with more than one automation system. In practice, Route Control is more commonly used with more than one automation system.

Number of ASs	See Section
	Guide: Configuring NetPro with One AS
	Guide: Configuring NetPro: AS 1 of Two ASs and Guide: Configuring NetPro: AS 2 of Two ASs

6.17.2 Guide: Configuring NetPro with One AS

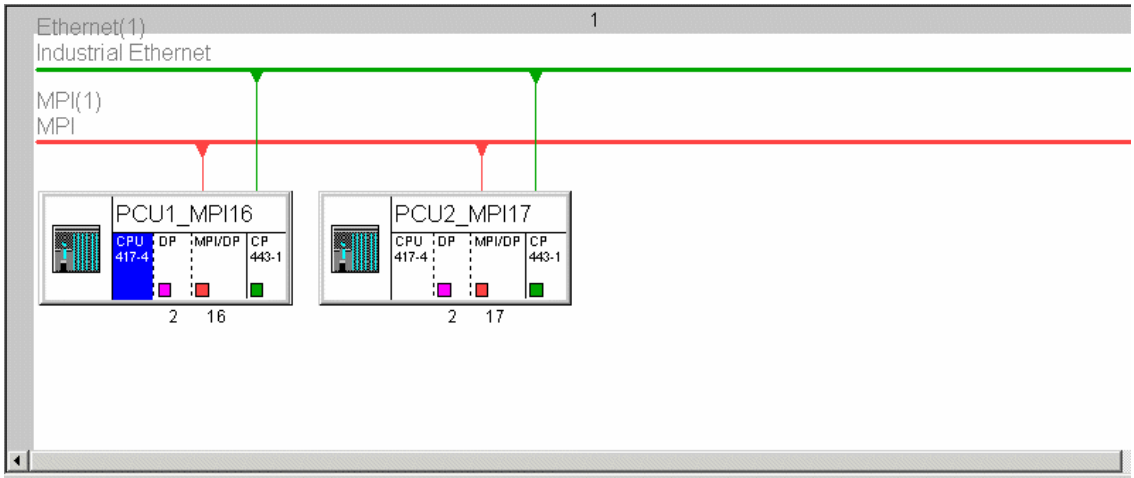
Configuration



Lokal ID	Partner	Type	Active Connection Partner	Subnet	Partner Adress
1	RC-SERVER	S7-connecti..	no	Ethernet(1) (IE)	...
2	RC-STANDBY	S7-connecti..	no	Ethernet(1) (IE)	...

6.17.3 Guide: Configuring NetPro: AS 1 of Two ASs

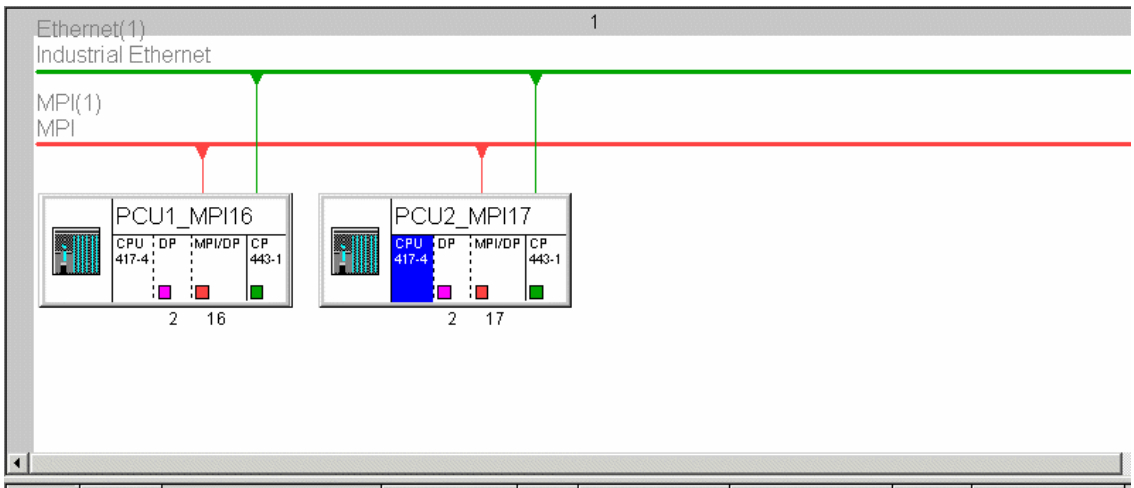
Configuration



Lokal ID	Partner ID	Partner	Type	Aktive	Send operating mode	Subnet	Partner Sc	Local address
1		RC-SERVER	S7-connection	no	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-CF
2		RC-STANDBY	S7-connection	no	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-CF
3	3	PCU2_MPI17 / CPU 417-4	S7-connection	yes	no	Ethernet(1) (IE)	CP 443-1	00-AB-BA-AF-FE-CF
50		TO REMOTE-SLAVE	S7-connection	yes	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-CF

6.17.4 Guide: Configuring NetPro: AS 2 of Two ASs

Configuration



Lokal ID	Partner ID	Partner	Type	Aktive	Send operating mode	Subnet	Partner Sc	Lokal Adress
1		RC-SERVER	S7-connection	no	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-DA
2		RC-STANDBY	S7-connection	no	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-DA
3	3	PCU1_MPI16 / CPU 417-4	S7-connection	no	no	Ethernet(1) (IE)	CP 443-1	00-AB-BA-AF-FE-DA
50		FROM REMOTE MASTER	S7-connection	no	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-DA

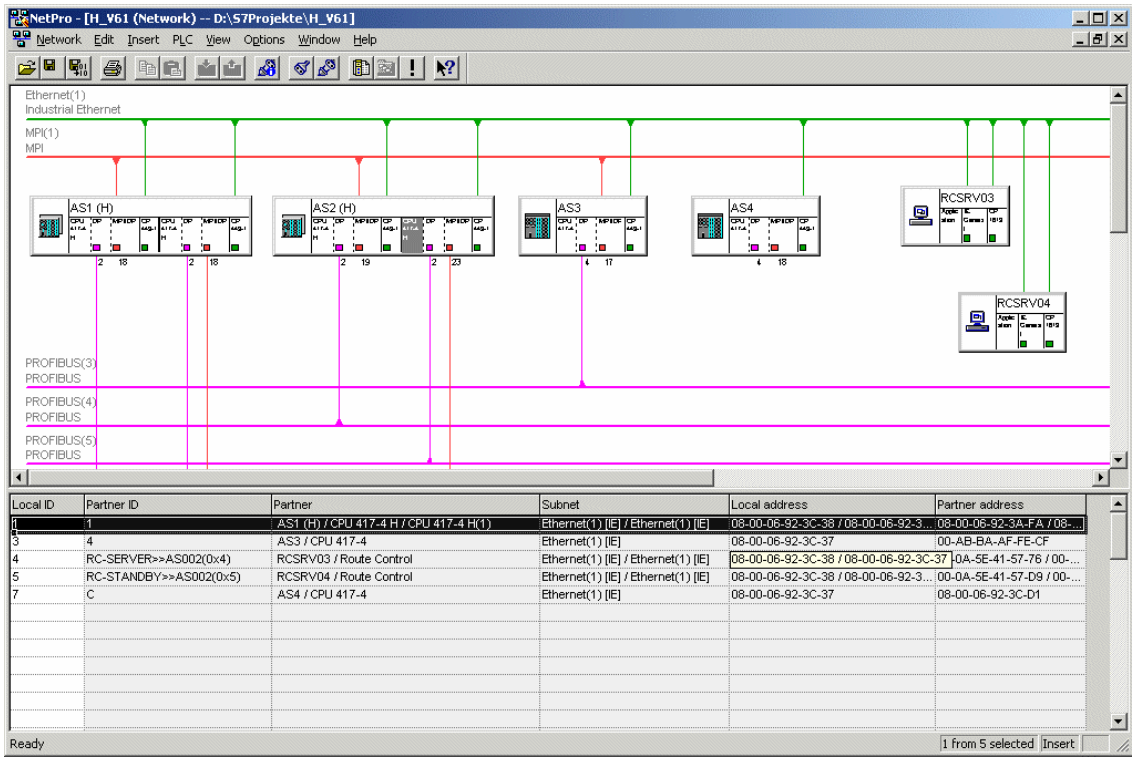
6.17.5 H-Machines

As of Route Control V6.1, H-machines (417-4H) are also supported. Material transports can also be performed by different types of automation systems (H-machines, non-H AS). The Route Control Wizard also provides support in the configuration of the AS-AS connections when H-machines are used (see Communication with H-Machines).

Procedure:

1. Configuration of the automation system in NetPro and HW Config
2. Start the Route Control Wizard for creating the communication connections
3. Download to the AS
4. Route Control engineering and download of the Route Control server
5. Automatic restart of the Route Control server

When an H-machine fails and the system switches to the second CPU, the Route Control server performs a general request for reasons of safety.



6.18 Route Control AS

6.18.1 Guide: Route Control Automation System

User Task

You wish to have an overview of how Route Control automation systems work and how tasks are allocated between the user program and Route Control.

Solution

The user program is the controlling instance for a route or, in a few special cases, multiple routes (overlapping routes). The user program can be developed either with or without the SFC sample block provided by Route Control as a basis. The user program can also be a stage of a recipe system - Example: In a recipe, a "transport stage" containing the source and destination of a material transport, as well as the material itself, is used in an appropriate location.

Therefore, the only interface to the user program is the RC_IF_ROUTE block, which acts as a link between the user program and the route control kernel in the automation system. For some overview illustrations, refer to Guide: Route Control, Overview and Guide: Route Control, General. Communication between the Route Control automation systems and the Route Control servers is transparent to the user program. The same applies for route searches, combining of element lists, and distribution of such lists by the server to all participating Route Control automation systems. Route Control even activates elements involved in the route. Only at the element level does Route Control have to provide interface blocks to interface process-related elements (that is, blocks from the standard library) in this case. Once any necessary modifications or adaptations have been made, technological blocks from other libraries can also be interconnected to the interface blocks of Route Control.

If the route used for a material transport uses elements that are allocated across several automation systems, Route Control automatically carries out data exchange between the automation systems via cross-coupling connections - here, too, the data exchange is transparent to the user program. Route Control can even integrate elements of an entirely different Route Control project (!) in a route (referred to as the Remote Elements concept).

Example

Check List

6.19 Route Control Server

6.19.1 Guide: Route Control Server

User Task

You wish to obtain an overview of the Route Control server and operator interfaces.

Solution

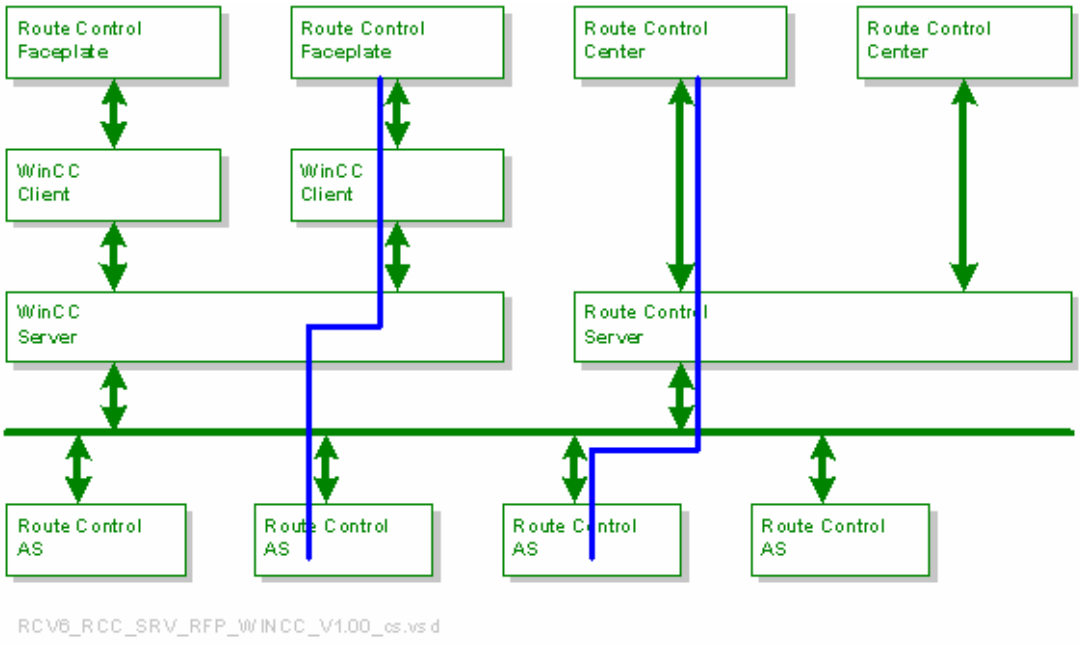
The Route Control runtime environment comprises three components:

- Route Control server
- Route Control Center
- Route Control faceplate for WinCC

Example

For additional information about the interfaces, refer to Server (Overview)

The following figure illustrates how the Route Control faceplate and Route Control Center user interfaces receive data.



Check List

- You are familiar with the interfaces of the Route Control server
- You are familiar with the interfaces at the operator stations
- You know how they interact, that is, how the servers and operator stations exchange data

6.19.2 Guide: Startup of the Route Control System

User Task

You would like to set up the Route Control system and you want to know how to correct or prevent any possible errors.

Solution

The Route Control automation systems (user program and Route Control blocks) must already be loaded and must be in RUN or RUN-P mode.

The Route Control server can be called using the Windows Start menu. During startup, it attempts to establish connections to each automation system. Automation systems that cannot be accessed are disabled. That is, their elements are locked (set to 'disabled') in the server. Once the server has established the connections, the project engineering is read in, and a general request is performed. This general request ascertains the current status of the routes and elements. This gives the server a current image of the plant, which is kept current by means of update telegrams.

Example

Check List

1. The S7 project engineering is available.
2. The Route Control project engineering is available
3. Blocks from the S7 project are compiled and downloaded to the automation system
4. The automation system is running.
5. The automation system and Route Control server are connected.
6. If necessary, start the WinCC project (runtime) and switch to the WinCC picture with a route
7. The Route Control server will start
8. The Route Control server starts up, including a general request
9. The Route Control server displays "ACTIVE" in the server dialog
10. Automatic or manual route requests can be performed

6.19.3 Guide: Material Sequences during Runtime

User Task

During runtime, the route search must take into account the predecessor material used and the material to be transported with the subsequent route.

Solution

1. Configure the materials, material groups, the assignment of materials to material groups, and the permitted sequential relationship between materials.
2. Configure partial routes that contain at least one linking element. Linking elements include memory cells to record the most recently transported material.
3. Specify the new material at the MATERIAL input of the RC_IF_ROUTE block. MATERIAL is a whole number (the ID from your project engineering). The material is specified by the user program.
4. Load these project data onto the Route Control server
5. Now make a route request with this material. Depending on whether or not the material was specified as a successor material, the route will or will not be found via the partial routes with the relevant linking elements.

Note

If a material group is permitted as a successor group, then all the materials assigned to this group can be also used as successor materials. Internally, the user program and the routing system work only with lists of materials, rather than material groups!

Example

In addition to the configuration dialogs, you will also find a sequence chart in:

Material: Sequence Chart for RC_IF_ROUTE

Check List

- You are familiar with each step required during project engineering and during runtime to influence the route search via predecessor and successor materials.

6.20 Route Control Special Topics

6.20.1 Remote Elements

6.20.1.1 Remote Elements, CFC Example

Note

These blocks are only required for communication between automation systems from multiple Route Control projects.

Use Case

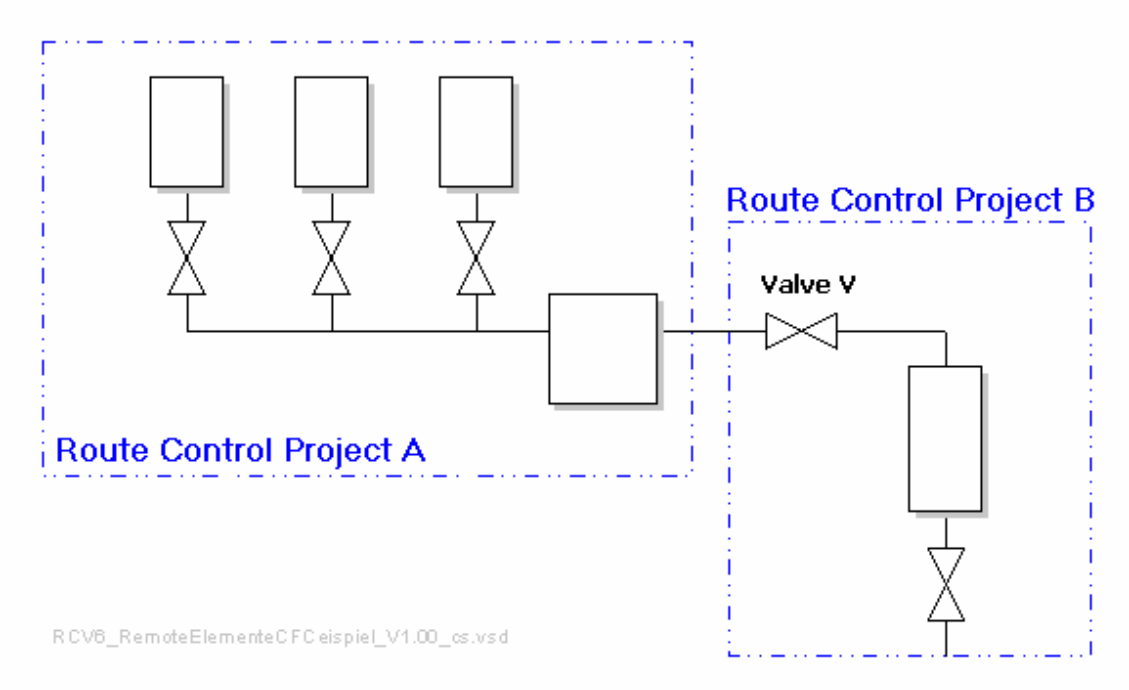
Remote elements are used whenever two production areas, each having its own S7 project/multiproject, and thus Route Control project, 'come into contact.' From the perspective of a control system, certain elements, such as a valve, are associated with both areas because they act as a link between them.

Basic Principle

The following example is based on an AS A.1 containing a control element (for example, valve V) that is in the range of Route Control project A. Route Control project B also uses valve V in one of its partial routes.

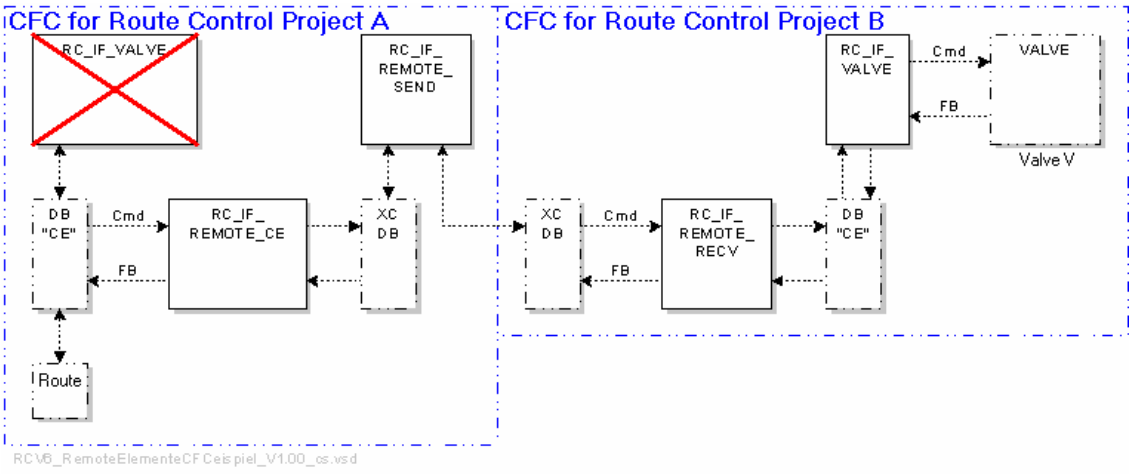
Note

Because communication via remote elements places a load on cross-coupling (and thus on the entire system), it is only intended for use in a limited number of elements.



Basic Structure of a CFC Chart

The CFC charts in S7 projects A and B have the following structure:



Note

Because valve V is physically present in project B, project A may not contain an interface block with the element ID of valve V!

Important

An RC_IF_CE_xxx block must be inserted for the element in the range (source range) containing the element. An RC_IF_REMOTE_RECV block must be inserted for each peer AS involved in exchanging remote element data.

To enable this element to be used in the destination area, an RC_IF_REMOTE_CE block must be inserted here, and an RC_IF_REMOTE_SEND block must be inserted for each peer AS involved in exchanging remote element data.

The RC_IF_REMOTE_RECV block must be inserted into a CFC chart of the automation system containing the control elements, whereas an RC_IF_REMOTE_SEND block must be inserted into the AS that will access these (remote) elements.

RC_IF_REMOTE_RECV and RC_IF_REMOTE_SEND are a mated set for communication between two automation systems.

6.20.1.2 Guide: CFC Remote Elements

Example

The element data must be exchanged between two automation systems. The AS containing the elements is referred to below as a peer AS, remote AS, or slave AS. The AS attempting to reference these elements or attempting to use their status in a separate routes is referred to as a local AS or master AS. Remote elements are intended for communication across Route Control projects rather than within the same Route Control project.

Basic Procedure

1. Configure NetPro connections (same communication ID for master and slave AS)
2. Insert elements in CFC chart (slave AS)
3. RC_IF_REMOTE_RECV in CFC chart (slave AS)
4. Insert route blocks in CFC chart (master AS)
5. RC_IF_REMOTE_... element blocks in CFC chart (master AS)
6. Specify block inputs (SNDRCVDB, alternate values, LOC_ID, REM_ID) (master AS)
7. Set NEW_GEN to 1 during runtime (master AS)
8. Control routes.

Rules for Peer AS (Provides Elements)

1. Insert an RC_IF_REMOTE_RECV block in the CFC chart. One of these blocks is necessary for each peer AS, i.e., for each logic connection to a peer AS from which elements are to be addressed.
2. In this block, create the communication ID that specifies the connection to the peer AS. This communication ID can be seen in NetPro and is identical with the ID in the other automation system in the other project.
3. Assign the number of the data block (parameter input SNDRCVDB) to be used by Route Control for the data transfer (for valid DB numbers, see Valid SNDRCVDB Block Numbers for Remote Elements)
4. Insert RC_IF_CE blocks for control elements, RC_IF_SE blocks for sensor elements and RC_IF_PE blocks for parameter elements that you want to address in routes in the slave AS and in the local master AS.
5. You do not need to assign a data block number in the actual elements, as you do for RC_IF_REM_...E blocks. Nor do you need to configure the inputs for LOC_..E and REM_...E to tell the element blocks which elements to use for data exchange between the local and remote automation systems.

Rules for the Local AS (Activates Elements From a Remote AS in a Local Route)

1. Insert an RC_IF_REMOTE_SEND block in the CFC chart. One of these blocks is necessary for each peer AS, i.e., for each logic connection to a peer AS from which elements are to be addressed.
2. In this block, create a communication ID that specifies the connection to the peer AS. This communication ID can be seen in NetPro.
3. Assign the number of the data block (parameter input SNDRCVDB) to be used by Route Control for the data transfer (for valid DB numbers, see Valid SNDRCVDB Block Numbers for Remote Elements)
4. Insert RC_IF_REM_CE blocks for control elements, RC_IF_REM_SE blocks for sensor elements, and RC_IF_REM_PE blocks for parameter elements you want to address in routes in the local AS, but which originate from the remote AS (remote elements).
5. Assign the same DB number (parameter input SNDRCVDB) to these elements as in the RC_IF_REMOTE_SEND block
6. Configure inputs for LOC_..E and REM_...E to tell the element blocks which elements to use for data exchange in the local and remote automation systems.
7. Change the alternate values in case of any problems with the connection to the peer AS.

NetPro

1. The connections in NetPro to other (Route Control) automation systems already exist, and the communication ID is known. These connections are always unspecified because the peer AS is in another S7 project.
2. The elements in the local and remote automation systems have already been configured and their IDs are known, either by manual assignment or assignment by the Route Control Wizard.

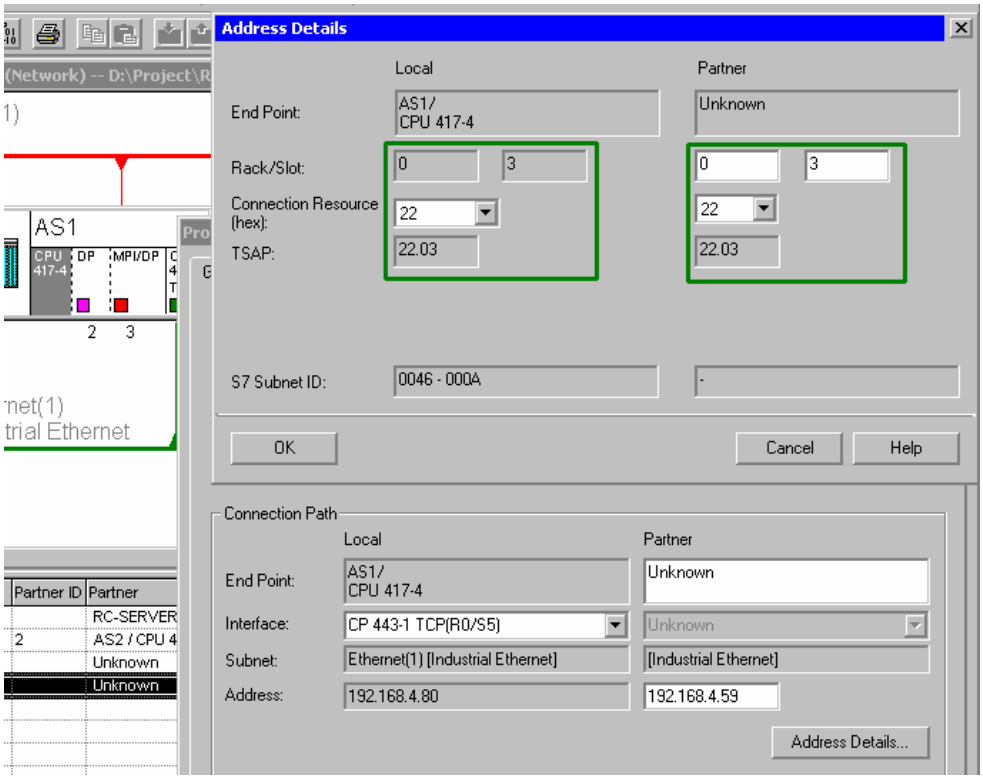
In NetPro, an unspecified connection to the MAC address of the peer AS is entered in the local AS, and in turn, an unspecified connection to the local AS with the same communication ID is entered in the peer AS.

Local AS: Remote Elements (NetPro Local AS)

Peer AS: Remote Elements (NetPro Peer AS)

Note

In addition, check the address details for the connection in NetPro. The same connection resources must be used. See figure below.



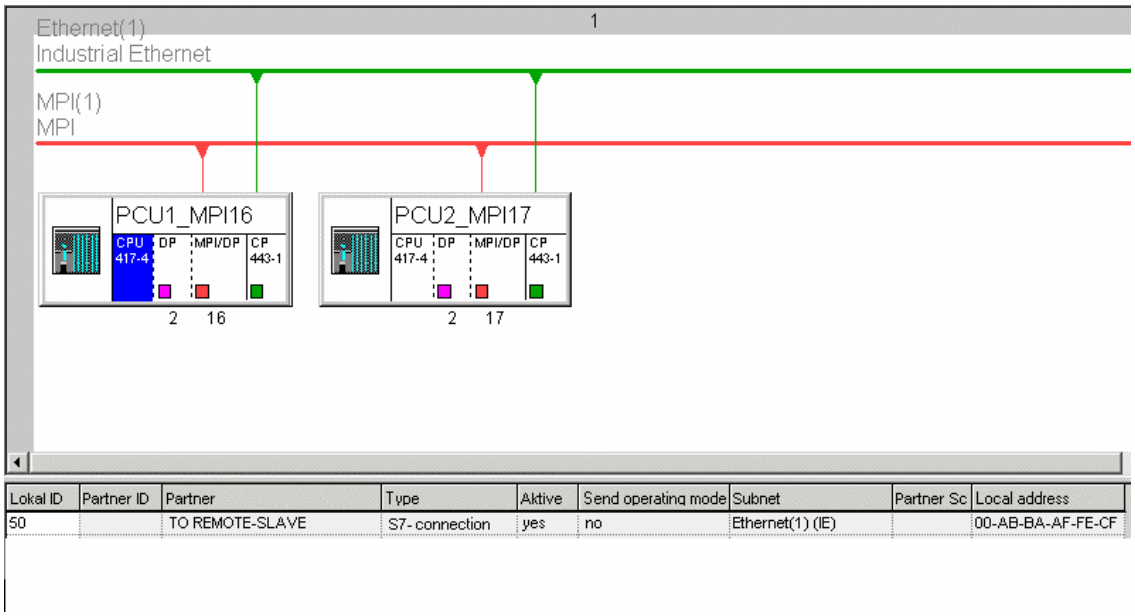
CFC Charts

Blocks must be inserted in a CFC chart and their parameters must be assigned in both the local and the remote AS:

Local AS: Remote Elements (CFC Chart Local AS)

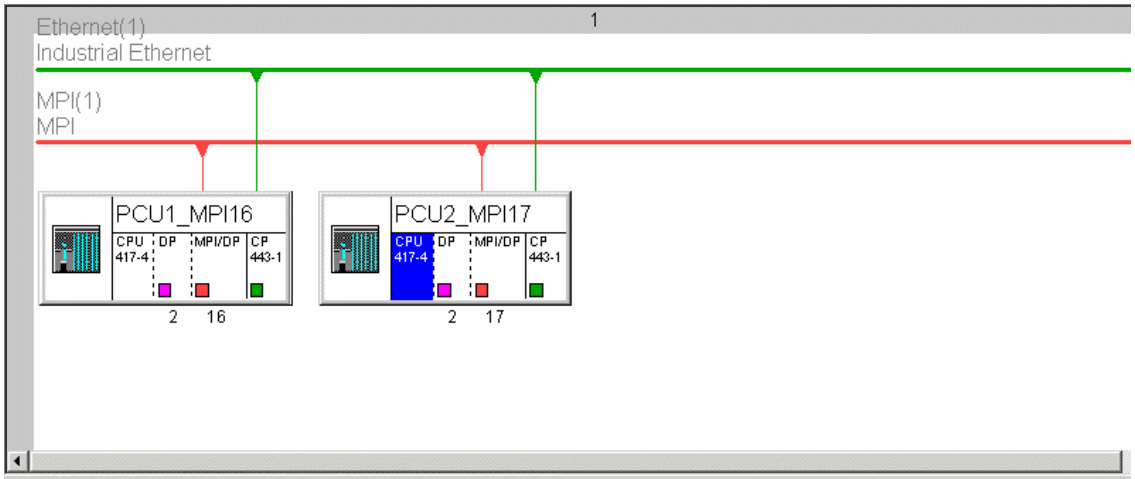
Peer AS: Remote Elements (CFC Chart Peer AS)

6.20.1.3 Remote Elements (NetPro Local AS)



Lokal ID	Partner ID	Partner	Type	Aktive	Send operating mode	Subnet	Partner Sc	Local address
50		TO REMOTE-SLAVE	S7- connection	yes	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-CF

6.20.1.4 Remote Elements (NetPro Peer AS)

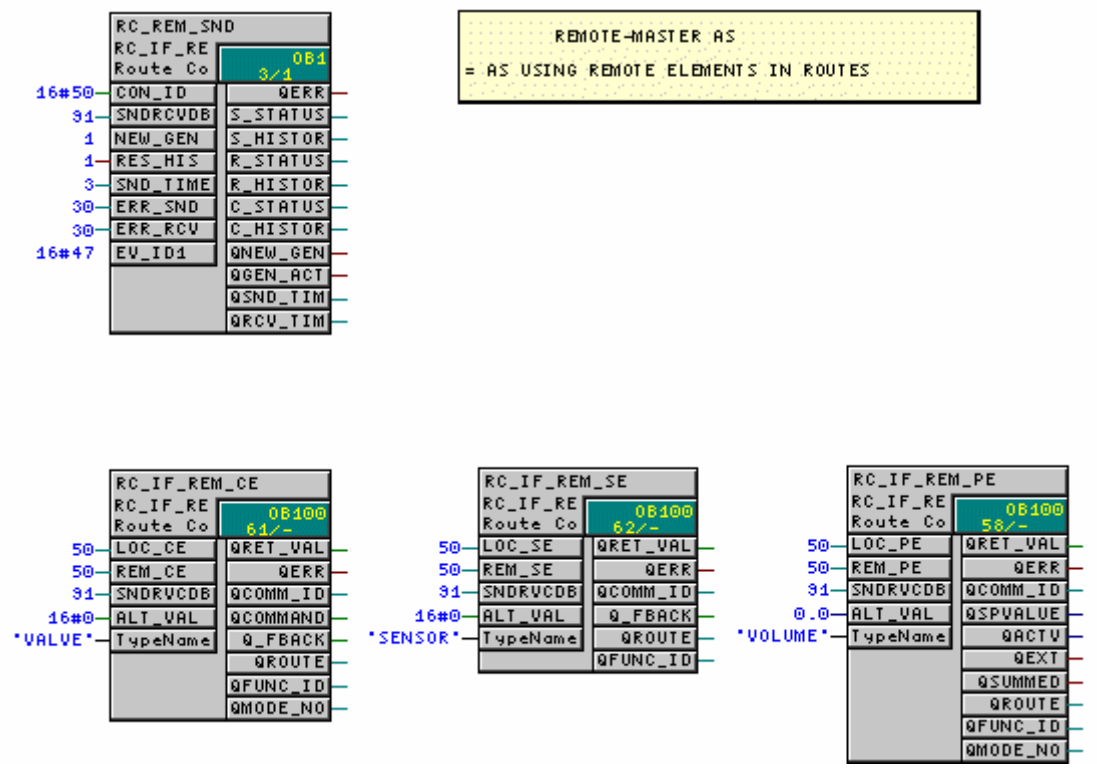


Lokal ID	Partner ID	Partner	Type	Aktive	Send operating mode	Subnet	Partner Sc	Local address
50		FROM REMOTE MASTER	S7- connection	no	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-DA

6.20.1.5 Remote Elements (CFC Chart Local AS)

CFC Chart

The element blocks serve as proxies for elements in the other AS.



Description of Blocks

RC_IF_REMOTE_SEND (FB831)

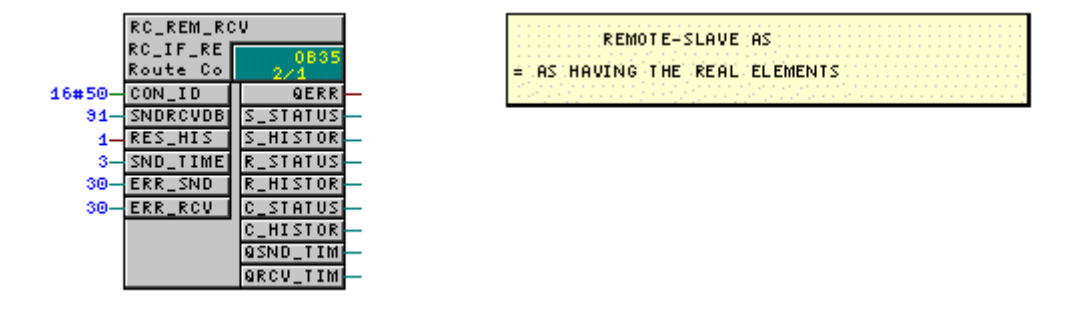
RC_IF_REMOTE_CE (FB821)

RC_IF_REMOTE_SE (FB842)

RC_IF_REMOTE_PE (FB843)

6.20.1.6 Remote Elements (CFC Chart Peer AS)

CFC Chart



Description of Block

RC_IF_REMOTE_RECV (FB833)

6.21 Dynamic ID Assignment

6.21.1 Guide: Dynamic ID Assignment

User Task

Your process cell has more than 300 routes, but no more than 300 material transports are to be carried out simultaneously. You want to include more than 300 RC_IF_ROUTE blocks in your project (CFC), but you cannot assign fixed route IDs, because there are not enough fixed IDs available.

You want to know how the concept of dynamic ID assignment works, what you must know for project engineering, and what the limitations are for this concept.

Solution

1. Place RC_IF_ROUTE blocks in your CFC charts but do not assign any route IDs (that is, the input ID for all or some of the instances of RC_IF_ROUTE is 0).
2. Start the Route Control Wizard, which transfers the fixed route IDs to the Route Control project engineering (these IDs will not be available for the dynamic ID pool).
3. You define the dynamic ID range in the Route Control project engineering (for each automation system)
4. This configuration will then be provided to the automation system during Route Control server startup.
5. Start the route from the user program (or, alternatively, from the Route Control faceplate).
6. Because the route ID still has a value of 0, the Route Control system first searches for an available ID in the automation system (if any IDs are still available). If an ID is found, it is written to the input ID of RC_IF_ROUTE, and the user program can control the route as it would with a fixed ID.
7. When the route is finished, the reserved ID becomes available again.

Example

For an example, refer to Guide: Exporting Routes

Check List

- You are familiar with the concept of dynamic ID assignment and how it differs from fixed ID assignment.
- You know the necessary steps for project engineering.
- You know how the ID is determined during runtime.

6.22 Overlapping Routes

6.22.1 Guide: Overlapping Routes

User Task

In practice, it is often the case that material transports do not take place only between a source and a destination, but must be switched over to another source or destination container during transport. Another use case scenario is the simultaneous removal from or filling of two or, generally, multiple source or destination containers.

Solution

A route or material transport is planned for each source or destination container that occurs more than once.

Multiple material transports contain the same function ID (FUNC_ID = x for both routes), so that the route search for the second material transport and for each additional material transport does not cause an error due to elements that have already been assigned.

Typically, a user program controls both material transports, since it can then decide when a switchover is necessary and when each material transport must be terminated.

Note

If a route is requested with a function ID of 0, this is caught by the automation system program (Route Control system), and the function ID is replaced by the route ID (default action), since a function ID of 0 would cause the elements in the Route Control server to be made available.

Therefore, we recommend that you (the user) use a range above 300 for the function IDs you assign.

This prevents overlapping with function IDs assigned by the system.

Example

Check List

- You are familiar with the concept of overlapping routes.
- You know how certain parameters should be assigned during runtime (FUNC_ID = x for both routes).

6.23 Setpoints during Runtime

6.23.1 Guide: Setpoints during Runtime (External Parameter Elements)

User Task

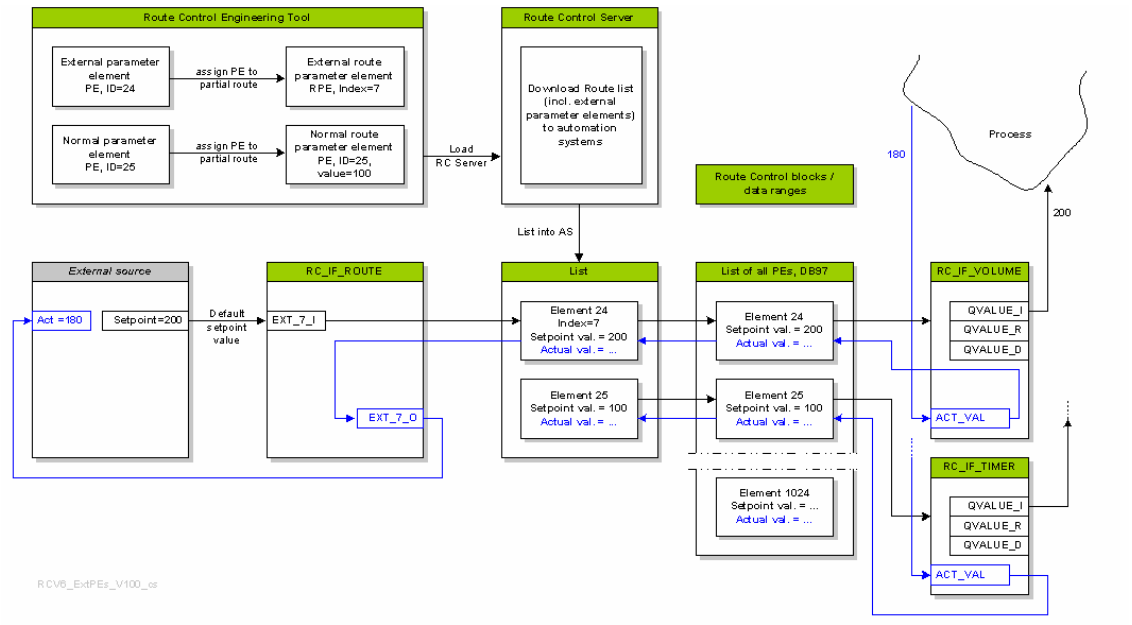
Certain setpoints are not yet known at the time when parameter elements are configured. For example, material quantities that must be weighed are typically supplied as batch parameters from a recipe system and are dependent on the size of the batch. Another example of such parameters are the setpoint and actual values level sensors. These values are compared, and the fill process is terminated when a set volume, which can only be determined during runtime, has been reached.

Solution

In such cases, so-called external parameter elements are included in a partial route. External parameter elements, or ext. PEs for short, are different from internal PEs in that configured setpoints do not represent the direct setpoint for the process, but act as an index for the inputs EXT_.. _I. whereby... stands for the index 1 to 24. This value can be specified in the properties dialog of an interconnected parameter element in a partial route.

Upon runtime activation of the mode level at which this parameter element is inserted in the partial route, the route transfers the value of the corresponding EXT_..._I input as a setpoint to the data record of a parameter element. (This can be seen in the RC_IF_VOLUME or RC_IF_TIMER interface block.) In return, the actual value of the parameter element is transferred to the outputs of RC_IF_ROUTE EXT_..._O, where it can be accepted by the user program. The ellipsis (...) corresponds to the index.

Example



Check List

- You know what external parameter elements are, how they are used, and how they differ from internal parameter elements.
- You know how external parameter elements are configured (RC engineering tool) and how data exchange takes place between the user program and the route (CFC chart with RC_IF_ROUTE and possibly RC_IF_TIMER or RC_IF_VOLUME).
- An "external" ID is set for the parameter element (CFC chart: RC_IF_... block).
- An index value has been assigned (interconnected parameter element)
- RC_IF_ROUTE inputs are interconnected with the source that specifies the external setpoint during runtime.

6.24 Material

6.24.1 Guide: Project Engineering of Material Sequences

User Task

You want to configure material master data - materials and material groups. In addition, the permitted material sequences must be configured so that they can be taken into account for route searches during runtime.

Solution

Materials, material groups, and permitted material sequences are specified in the Route Control project engineering environment. You can access the dialog to enter materials and groups using the **Options > Material > Configuration** menu command and the dialog for material sequences under **Options > Material > Material Sequences**.

If no material data are available, the system automatically creates a new database and briefly notifies you. You can now begin your project engineering immediately.

Examples

Project Engineering of Materials and Material Groups

Project Engineering of Material Sequences

Check List

- You know where materials and material groups are configured.
- You know how materials and material groups are specified in permitted sequences with other materials and material groups.
- You can modify the properties of materials and material groups.
- You know how to delete materials and material groups.

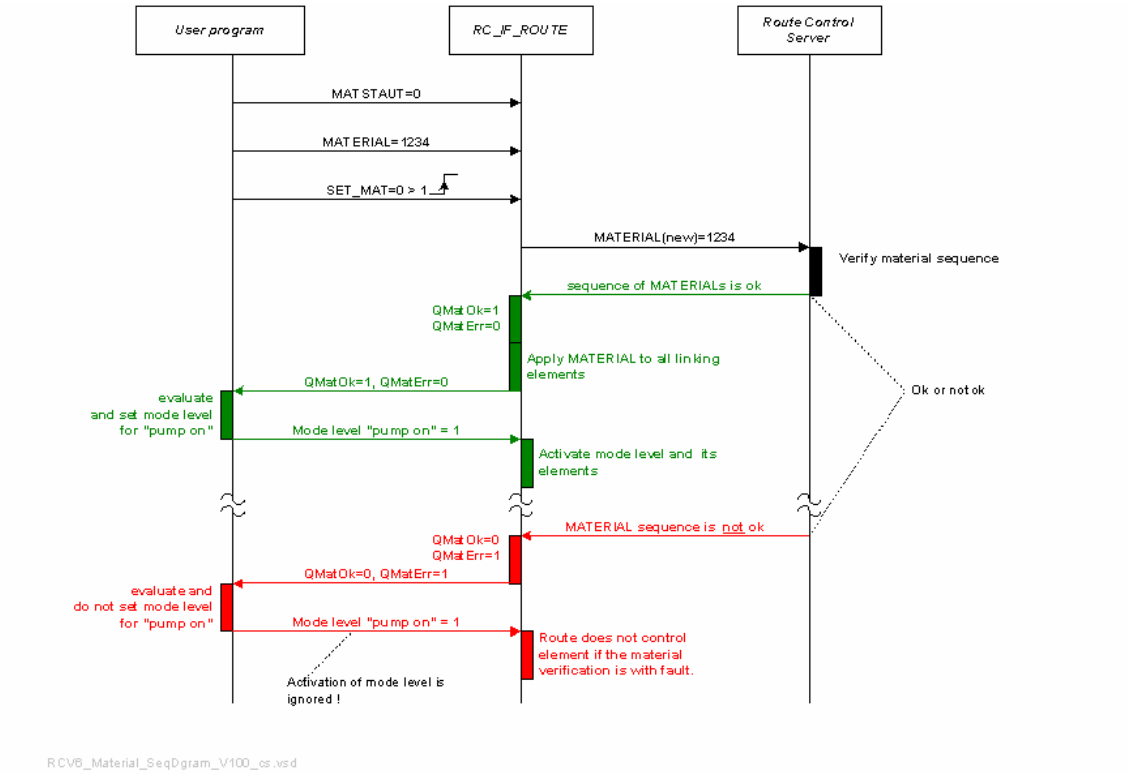
6.24.2 Project Engineering of Materials

User interfaces for the following are described in the appendix:

- Project Engineering of Materials and Material Groups and
- Project Engineering of Material Sequences

.

6.24.3 Material: Sequence Diagram for RC_IF_ROUTE



Note

The MATSTAUT parameter has not yet been implemented in Route Control V6.0 and is reserved for future. The material is applied to the linking elements using the SET_MAT parameter. See RC_IF_ROUTE (FB800).

The user program must evaluate the QMatOk and QMatErr outputs of the RC_IF_ROUTE block and respond accordingly. If a material error exists, requests from the user program are not accepted by RC_IF_ROUTE, and control elements cannot be activated. As a result, the new material is not transferred to the linking elements.

In the case of a successful material check, the following scenarios are applicable:

- The new material is automatically transferred by RC_IF_ROUTE to the linking elements if the value of input parameter MATSTAUT (material set automatically) is 1.
- The new material is not transferred by RC_IF_ROUTE to the linking elements until the value of input parameter MATSTAUT (material set automatically) is 0 and the positive edge appears at input SET_MAT.

The first case is intended for applications in which the application program leaves material transfer to the route. The second scenario applies if the application program 'knows' exactly which mode level represents the actual material transports

6.25 Configuring SIMATIC Manager

6.25.1 Overview

Route Control project engineering involves a number of steps:

- Planning in the context of an S7 project

Guide: Configuring the Automation Systems

CFC: Project Engineering of Routes

CFC: Project Engineering of Elements

NetPro - Project Engineering of Cross-Coupling

Route Control Wizard

Transfer to Route Control Project Engineering

- Planning in the context of the Route Control engineering application

Transfer from an S7 Project

Project Engineering of User-Defined Element Types

Project Engineering of Mode Tables

Project Engineering of Mode Levels

Project Engineering of the Route Control Server

Note

All references to an S7 project below assume the use of an S7 project in a multiproject.

6.25.2 Downloading Blocks to the AS

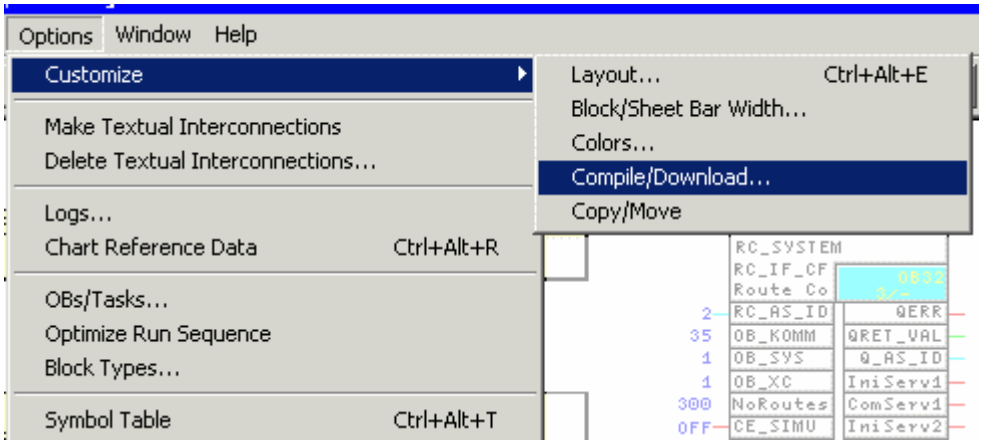
References:

Downloading Blocks to the AS (Instance DB)

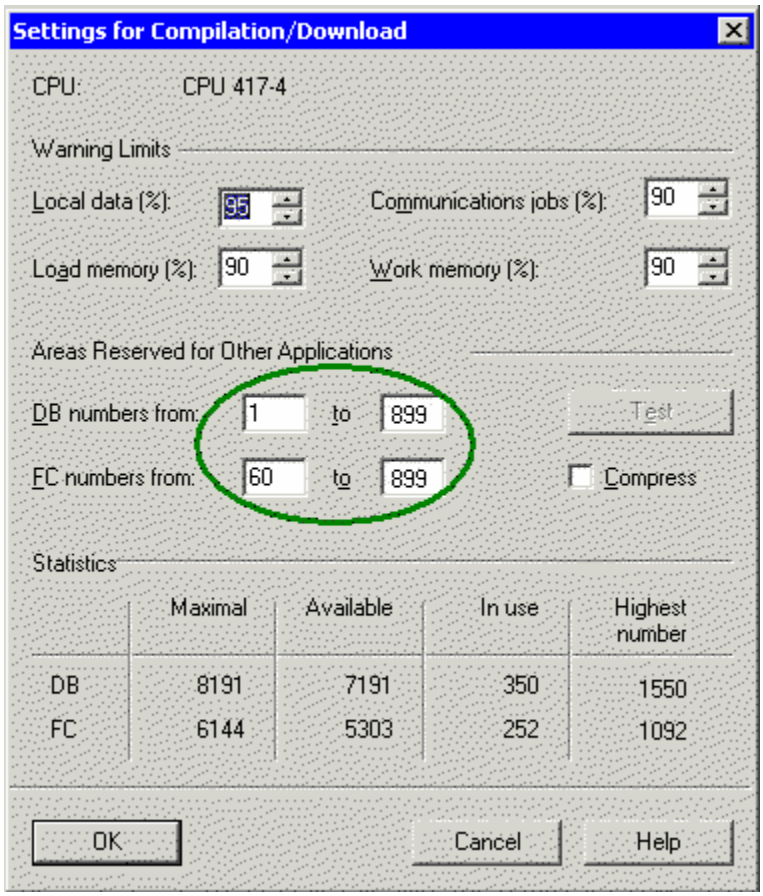
Downloading Blocks to the AS (User Blocks)

6.25.3 CFC - Modifying Block Ranges

From the perspective of an S7 project, the SIMATIC Route Control blocks are user blocks. Because the default settings of an S7 project are too low, you must modify the range.



In the CFC editor under Options > Settings > Compile / Download, open the settings dialog and modify the range of the data blocks and function blocks by setting the upper limit to at least 899.



6.25.4 CFC - Project Engineering Routes

A separate instance of block type RC_IF_ROUTE must be inserted in a CFC chart for each route (later, material transport).

Note

Use a separate CFC chart for each instance, as it will also contain the user block, such as a phase module, in addition to RC_IF_ROUTE.

6.25.5 CFC - Project Engineering of Elements

For every element to be controlled in the system, a block from the standard library is inserted in a CFC chart. Other block libraries can also be used, but if this is done, it must be ensured that the blocks from these libraries are compatible with the interface blocks of the routing system.

For each element block, an interface block for the routing system is inserted, preferably in the CFC chart. This interface block links the external block to the data administration of the routing system in the automation systems.

Examples: RC_IF_MOTOR and MOTOR, RC_IF_VALVE and VALVE, etc.

6.25.6 NetPro - Project Engineering of Cross-Coupling

Project engineering for cross-coupling is divided into several steps:

- Project engineering of communication links between automation systems
- Project engineering of (local) communication IDs in the Route Control configuration block (CFC)

See also:

Guide: Configuring NetPro with One AS

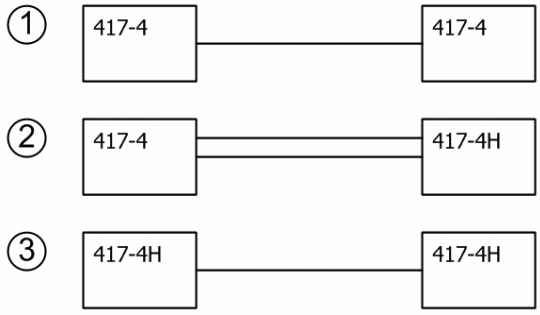
Guide: Configuring NetPro: AS 1 of Two ASs and

Guide: Configuring NetPro: AS 2 of Two ASs

Communication with H-Machines

6.25.7 Communication with H-Machines

The communication connections for H-machines are also created by the Route Control Wizard. There are different scenarios in this regard:



verb417_417h.vsd

#	Partner #1	Partner #2	Description
1	417-4	417-4	The Route Control Wizard creates a **standard connection** between two non-H AS
2	417-4	417-4H	The Route Control Wizard creates a **two normal connections** between a non-H AS and a fault-tolerant AS (H-machine with 2 CPs). A fault-tolerant connection is not possible in this case.
3	417-4H	417-4H	The Route Control Wizard creates a **fault-tolerant connection** if the two communication partners are H-machines.

417-4 always means a 416-3 AS (both non-H AS).

6.25.8 Route Control Applications (HW Config)

As of V6.1 SP1, special RC applications are provided in the hardware configuration (HW Config). Similar to Batch and WinCC, these appellations represent active Route Control processes on a server or client station.

Please configure an RC application for the master station (server). You can find the RC application in HW Config in the PCS7_V61 catalog under Route Control. Please configure an RC application (stby) for a standby station (server) and an RC application (client) for a client station where a Route Control Center will run.

The Route Control Wizard will now automatically detect the RC server and client stations based on the configured applications. You no longer have to select the standard applications as you did V6.1. See also: Route Control Wizard.

6.25.9 Route Control Wizard

The Route Control Wizard is activated by means of a menu command in SIMATIC Manager. This wizard helps you with project engineering and configuration of relevant information for Route Control.

The Route Control Wizard carries out the following tasks:

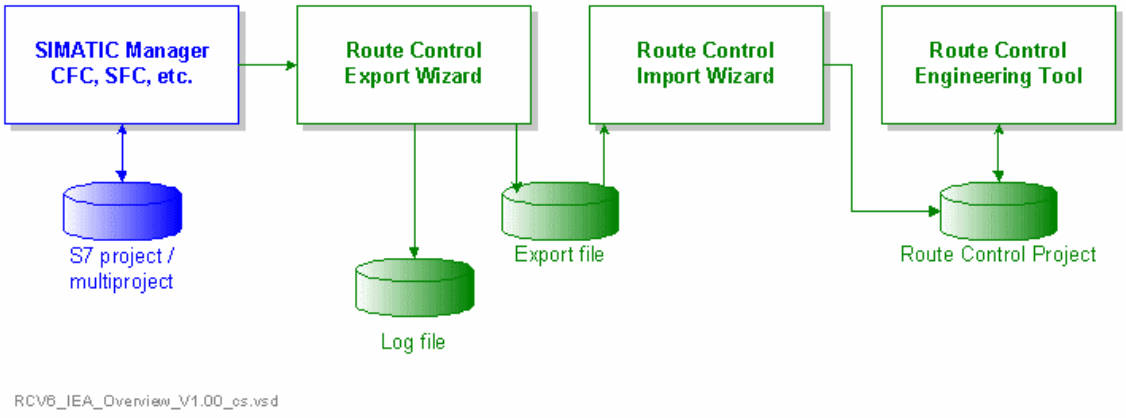
- Export of elements to the Route Control project engineering
- Specification of dedicated WinCC message servers (WinCC master server)
- Automatic configuration of cross-coupling

The dialogs included in the wizard and tasks that operating personnel can be accomplish using the wizard are described in detail in a section dedicated entirely to the Route Control Wizard.

Route Control Wizard: Actions

6.25.10 Import from an S7 Project

The Import wizard in the Route Control engineering tool is the counterpart to the Route Control Wizard in SIMATIC Manager. The following figure illustrates the interaction of all components:



The log file can be opened with the Windows editor (Notepad). The export file has an internal version ID written by the Export wizard and checked by the Import wizard. This file can only be read by the Import wizard if the file ID is the same for the Export wizard and the Import wizard. (This ID number only increases when structural changes take place in the context of a new software version.)

Note

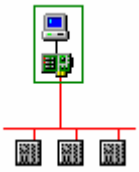
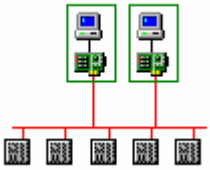
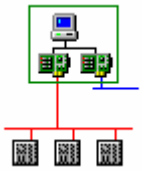
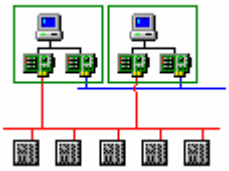
Project engineering of the Route Control data is done according to the "Single Point of Data Entry" principle. That is, if data are entered in an S7 project, their parameters must also be assigned in the S7 project. However, to simplify project engineering for Route Control, these data can then be transferred to the Route Control project. Data that cannot be entered in SIMATIC Manager / S7 project, such as partial routes, are then added to the Route Control project.

6.25.11 Project Engineering of the Route Control Server

Overview

The Route Control server can be configured as a standalone computer or a redundant two-server system. A server (or each of the two redundant servers) can be equipped with one or two network cards. Two network cards are used to separate the OS-OS network from the OS-AS network.

For an overview of all constellations, see Route Control Wizard: Network Constellations

	One Route Control Server	Two Route Control Servers
One network card		
Two network cards		

Requirements

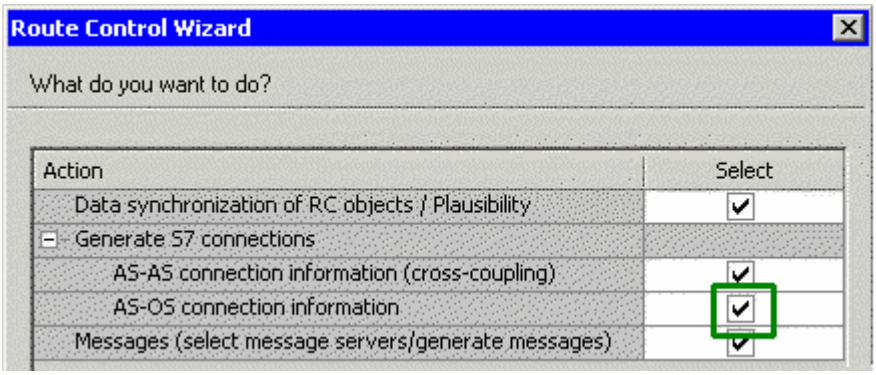
The server computers are physically present and equipped with the appropriate network cards. The respective IP address is set up, and Route Control server component is installed.

An S7 project is available on the ES.

Project Engineering of the Server

To a large extent, the Route Control server and its properties are configured in the Route Control Wizard.

1. Call the Route Control Wizard and select AS-OS Connection Information (see also Route Control Wizard: Selection of Actions)



2. Enter the required data in the dialog provided to enter and configure server data (for details, see Route Control Wizard: AS-OS Connection (MAC Address) and Route Control Wizard: AS-OS Connection (TCP/IP Address))
3. To export the data you entered, follow all steps in the wizard until you reach the end.
4. In the Route Control project, perform the S7 import, see Route Control Wizard: Import
5. Now check the data you have imported (see Route Control Wizard: Import)
6. Load the Route Control project engineering onto the Route Control server
7. Start (or restart) the server - see also Server (Overview)

6.25.12 Project Engineering of User-Defined Element Types

A major advantage of Route Control is that it allows you to create your own user-defined element types, insert them in CFC, and export them to a Route Control project. Thus, for example, you can use a motor with a special activation control and different feedback signals.

To this end, the standard blocks (in this case, RC_IF_MOTOR) are called (enclosed) in a user block. This user block receives several special attributes, called UDA (user-defined attributes), which tell the Route Control Wizard that this block is relevant for data export.

See also Example of a User-Defined Type

6.25.13 Transfer to Route Control Project Engineering

A large portion of the project engineering data created in the S7 project can be reused for the Route Control project.

For a detailed list of all data that can be transferred and a description of how to transfer data using the Route Control Wizard, refer to Route Control Wizard: Actions

6.26 Configuring RC Configuration Tool

6.26.1 Getting Started

6.26.1.1 Starting the RC Engineering Tool

There are two ways to start the RC engineering tool:

- With the Windows Start menu: Start \ SIMATIC \ Route Control \ Engineering
- Directly from STEP 7 in SIMATIC Manager using the Options \ Route Control \ Engineering menu command

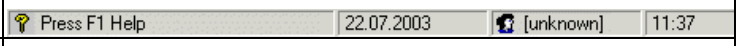
If the RC engineering tool is started by means of SIMATIC Manager, the S7 project context is provided automatically, and the correct RC project database, if available, is opened.

If the RC engineering tool is started using the Windows menu, you must manually create the project context the first time you start the tool using the command File / Open to select the path to an S7 project (*.s7p) or an S7 multiproject (*.s7f).

The RC engineering tool will now automatically open the stored RC project database associated with this path. If a project engineering database has already been opened, this is saved when the tool is closed, and the database is automatically opened when the tool is reopened using the Windows menu.

6.26.1.2 Engineering Tool Menu

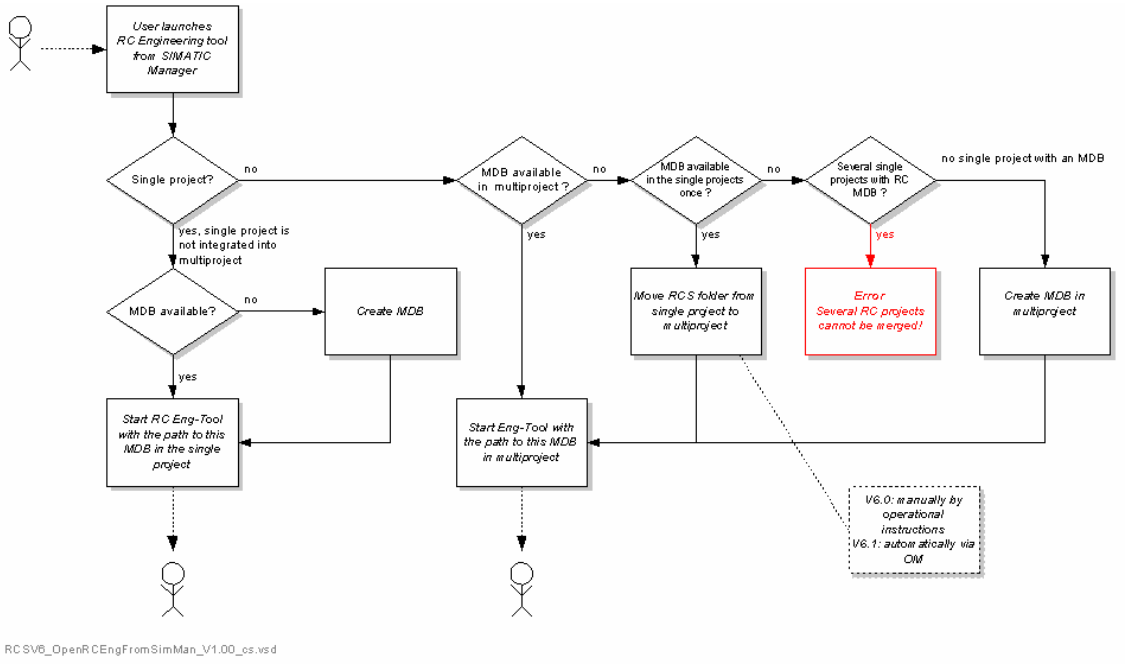
Menu Command	Subcommand	Meaning
File	New	Creates a new Route Control project database. As a rule, this function is not necessary if the Route Control engineering environment is started by means of SIMATIC Manager, as this automatically creates a database file in the correct path under the S7 project.
	Open	Opens an existing database file. Like the File > New menu command, this function is usually not necessary if the Route Control engineering environment is started by means of SIMATIC Manager, as this automatically creates a database file in the correct path under the S7 project.
	Close	Closes the database file. The database is also closed automatically when the Route Control engineering tool is closed.
	Save As	Saves the database file under another path and name, both of which can be selected. Use this function to create backup copies of the database file.
	Report	Creates and prepares reports (lists) for printout
	Delete	Deletes the database file
	Log On	Logs a user on in the Logon service This menu item can only be accessed if no other users are logged on.

Menu Command	Subcommand	Meaning
	Log Off	Logs a user off from the Logon service This menu item can only be accessed if no other users are logged on.
	1...	Reopens the most recently opened database
	...	
	4...	
	Exit	Closes the Route Control engineering tool
Edit	Cut	Availability of the following functions depends on the object selected. Cuts an element and copies it to the clipboard
	Copy	Copies an element to the clipboard
	Paste	Pastes an element from the clipboard to a selected location
	Delete	Deletes an element
	Rename	Renames an element
	Properties	Opens the Properties dialog for the selected element
View	Large Icons	Displays elements as large icons
	Small Icons	Displays elements as small icons
	List	Displays elements in list format
	Details	Displays elements in list format with list properties
	Function Bar	Shows and hides function bar
	Status Bar	Shows and hides the status bar 
Tools	Settings	Changes language setting when SIMATIC Manager is not installed; otherwise, the language setting in SIMATIC Manager is used Automatically compresses the database (recommended) Enables system dialogs: The initial general information dialog in the wizard can be suppressed. These system dialogs can be displayed again using this function.
	Compress Database	Performs compression once
	Load Server	Loads Route Control project engineering to the Route Control server. The database file is not yet activated. ! The changes, and thus the database file, are not active until they have been enabled by means of the Route Control Center.
	Check Route	Checks the route network based on the configured partial routes and elements. This does not involve the runtime system!
	Check Consistency	Checks the database, its tables, and configured entries for consistency: - ID conventions - Sort order of elements - Variant check - Activation of elements: An element must not be inserted in the same mode level with different commands.

Menu Command	Subcommand	Meaning
	Export / Import	Route Control project engineering interface to other applications: - For CSV interface, see Guideline: CSV Interface - Import wizard for data from the S7 project, see Route Control Wizard: Import
	Material	Configures materials, material groups, and material sequence relationships
Window	Arrange	Changes the window arrangement of open windows in the application: - Cascade - Tile horizontally* - Tile vertically* - Arrange icons * At least two Route Control projects should be open.
	Minimize All	Minimizes all open windows
	Close All	Closes all open windows
	1...	Path to S7 project
Help	Contents	Opens the Help system
	What's This? F1	Opens the Help system and jumps to a description of the active dialog box
	Introduction	Opens the Help system and jumps to the introduction
	Getting Started	Opens the Help system and jumps to the description of Getting Started
	Using Help	Opens the Help system and jumps to a description of how it can be used to find additional information
	About	Opens a dialog box with information about the product name and version, copyright, company, etc.

6.26.1.3 Saving a Route Control Project

Because a Route Control project is assigned either to an individual S7 project or to an S7 multiproject, this is also used to specify the storage location of the Route Control project database.



Note

If you start out with an individual S7 project and then opt for an S7 multiproject after you have already created a Route Control project in the individual S7 project, you must manually move the \global\rcs directory from the individual S7 project to the multiproject in Route Control (while the project is closed).

6.26.1.4 Converting a Route Control Project

If you attempt to open an older Route Control project with the RC engineering tool, you will receive a notice that a conversion is necessary due to a change in the database structure. You can reject this notice, but if you do so, you will not be able to open your old RC project engineering data with Version 6 of the RC engineering tool. Therefore, you should accept the prompt to convert your old project engineering to the new format.

For a more detailed description about the user interfaces, refer to "Warning Dialog for Conversion" and "User Interface for the Conversion Tool" in the section Dialogs.

6.26.1.5 Creating a New RC Project

You can use the RC engineering tool to create a new RC project. In the File dialog, select the path to an S7 project (*.s7p) or S7 multiproject (*.s7f).

RC will now create an RC subdirectory and a project engineering database (\global\rcs\) associated with this path. In doing so, RC assumes that the \global subdirectory already exists, as RC is always stored in an S7 project or an S7 multiproject.

The RC engineering tool will automatically open the existing project engineering database, and you can now begin your project engineering.

6.26.1.6 Main View of the RC Engineering Tool

The RC engineering tool is divided into two sections:

- The top section (1a and 1b) shows the route-neutral objects and pool of elements. In addition, global data such as the properties of the RC server are to be configured here.
- The bottom section (2a and 2b) contains the mode levels, partial routes, and their elements, that is, the route-dependent, interconnected elements.

Start with the top section and import data and objects that already exist in the S7 project and do not have to be configured twice. The next step explains how to do this.

6.26.1.7 Transferring Data from an S7 Project

The following data can be transferred from an S7 project or the projects of an S7 multiproject:

- Plant hierarchy
- Elements
- Routes
- Automation systems

6.26.1.8 Server and Redundancy Scenarios

Typical approved and intended server combinations are presented below. For demarcation purposes, the combinations shown include a few typical combinations that have been requested by some customers but are not intended and thus have not been tested and released.

Route Control Configurations

Route Control Configurations (non-redundant)

Route Control Configurations (redundant)

In addition, the settings made by the Route Control Wizard for the two switches in the global settings of a Route Control project are specified. For additional information, refer to Global Settings.

6.26.2 Global Project Settings

6.26.2.1 Global Settings

All global settings required for a Route Control project are configured in one place (Project Settings \ Runtime Parameters) in the Route Control engineering tool.

Settings

Global Settings - General

Global Settings - Material

Global Settings - Rules for the Route Algorithm

Global Settings - Monitoring (Redundancy)

Additional Descriptions

Global Settings (Monitoring of Servers and AS)

Global Settings (Information about 'Maintenance')

6.26.2.2 Global Settings – General

Note

These two settings are automatically made by the Route Control Wizard. Normally, the user should not change these settings. For commissioning, however, it can be advantageous to uncouple the Route Control server from startup of WinCC or PCS 7 redundancy.

No.	Key	Standard Value	Value Range and Description
	Route Control server startup dependent on WinCC runtime	No	Setting indicates whether or not the Route Control server is to wait upon startup for the WinCC signal indicating that WinCC runtime is active. If the Route Control server starts up too soon and is already issuing messages even though WinCC runtime is not yet (completely) active, messages can be lost. No: The Route Control server does *not* wait for WinCC during startup Yes: The Route Control server waits during startup until WinCC has set up. For an overview of the combinations supported by Route Control, refer to Server and Redundancy Scenarios
	Use PCS 7 redundancy	Yes	Indicates whether or not the Route Control server is to log on to the PCS 7 redundancy control. Yes: The Route Control server logs on to the PCS 7 redundancy control during startup and monitors for failure, same as WinCC or the SIMATIC BATCH control server. If a failure occurs in one of the monitored applications, a failover to the standby computer is triggered. No: The Route Control server does not log on to the PCS 7 redundancy control during startup. Rather, Route Control uses its own redundancy control (see Global Settings (Monitoring of Server and AS)). For an overview of the combinations supported by Route Control, refer to Server and Redundancy Scenarios For redundancy within Route Control, failover can be initiated by pressing the "Exit" button; this action takes place on the master computer, which then powers down, and the standby computer becomes the master.

Additional Settings

Global Settings

Global Settings - Material

Global Settings - Rules for the Route Algorithm

Global Settings - Monitoring (Redundancy)

Additional Descriptions

Global Settings (Monitoring of Servers and AS)

Global Settings (Information about 'Maintenance')

6.26.2.3 Global Settings – Material

No.	Key	Standard Value	Value Range and Description
	Enable material option	No	No: The Route Control server does *not* read in the material configuration during startup; the material sequence *is not checked* when a route request is made. Yes: The Route Control server reads in the material configuration during startup, and the material sequence is checked when a route is requested. Some routes might not be found due to illegal materials.
	Ignore unknown Materials	No	Only relevant when material option (2) is activated. No: A route request with unknown materials results in a request error. Yes: Unknown materials in a route request are ignored.
	Use external material configuration	No	No: Depending on the value of the "Activate Material Option" button (see above), either the internal material configuration is used or the material configuration is deactivated. Yes: The external material configuration with specification during runtime is used; see Material Interface

Additional Settings

Global Settings

Global Settings - General

Global Settings - Rules for the Route Algorithm

Global Settings - Monitoring (Redundancy)

Additional Descriptions

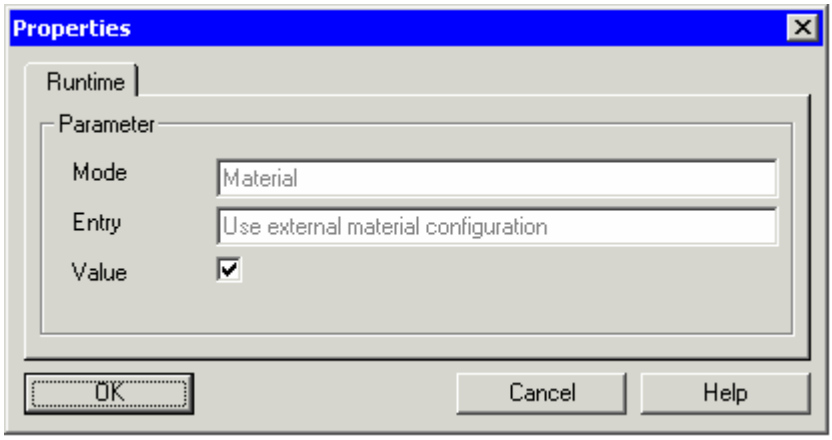
Global Settings (Monitoring of Servers and AS)

Global Settings (Information about 'Maintenance')

6.26.2.4 Runtime Parameters (External Material Configuration)

This dialog is available in Version 6.0 SP1 and higher.

Dialog



Description

In this dialog, you specify whether you want to apply external material configuration; see also Global Settings.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Mode	Name of group
Entry	Name of property (switch)
Value	Yes: External material configuration is applied. Files are transferred during runtime on the RC server (RC_LOAD directory) No: Internal material configuration is applied, or no material configuration is used: see also Material Interface

6.26.2.5 Global Settings - Rules for the Route Algorithm

No.	Key	Standard Value	Value Range and Description
	Ignore 'manual' elements	No	No: Elements in manual mode could cause an error during a route search, since routes are not permitted to go over manual elements. Yes: Manual elements are ignored; routes over manual elements are accepted and found.
	Ignore elements 'in maintenance'	No	No: Elements in maintenance mode could cause an error during a route search, since routes are not permitted to go over such elements. Yes: Elements in maintenance mode are ignored; routes over such elements are accepted and found.
	Ignore 'faulty' elements	No	Faulty elements = elements with error status No: Elements with error status could cause an error to occur during a route search, since routes are not permitted to go over such elements. Yes: Elements with error status are ignored, and routes over such elements are accepted and found.
	Ignore 'inactive' elements	No	No: Inactive elements could cause an error to occur during a route search, since routes are not permitted to go over such elements. Yes: 'Inactive elements are ignored, and routes over such elements are accepted and found.
	Ignore element 'affected by other elements due to maintenance	No	No: Elements affected by maintenance of another element could cause an error to occur during a route search, since routes are not permitted to go over such elements. Yes: Elements that are affected by maintenance of another element are ignored, and routes over such elements are accepted and found.

Additional Settings

Global Settings

Global Settings - General

Global Settings - Material

Global Settings - Monitoring (Redundancy)

Additional Descriptions

Global Settings (Monitoring of Servers and AS)

Global Settings (Information about 'Maintenance')

6.26.2.6 Global Settings - Monitoring (Redundancy)

No.	Key	Standard Value	Value Range and Description
	Cycle time for server/AS monitoring	15	Specifies monitoring time in seconds Value range: 1 to 999 (seconds) The higher this value is, the higher the system tolerance for missing telegrams. See Global Settings (Monitoring of Servers and AS) This value must be used in conjunction with the 'Number of permissible missing monitoring telegrams' key. Note: This setting is only relevant if Route Control is using its own redundancy control (see 'Use PCS 7 redundancy' setting)
	Number of missing supervising telegrams	5	Number of missing response telegrams permitted from the AS to the server before an automatic failover occurs. Value range: 1 to 99 (number of telegrams) The higher this value is, the higher the system tolerance for missing telegrams. This value must be used in conjunction with the 'Cycle time for server/AS monitoring' key. See Global Settings (Monitoring of Servers and AS) Note: This setting is only relevant if Route Control is using its own redundancy control (see 'Use PCS 7 redundancy' setting)
	Automatic server failover in the event of error	Yes	Yes: The system switches over to the standby computer if the maximum tolerance time is exceeded. No: The system *does not* switch over to the standby computer when the maximum tolerance time is exceeded. In this case, manual failover is required. See Global Settings (Monitoring of Servers and AS) Note: This setting is only relevant if Route Control is using its own redundancy control (see 'Use PCS 7 redundancy' setting)
	Automatic restart when AS is recovered	Yes	Yes: Failure of the connection between the master server and an AS triggers an automatic server restart. In this case, the AS is disabled, that is, all elements of this AS are "artificially disabled." If the connection is restored, then the elements are also 'enabled' automatically. No: Any AS failure is ignored, and routes that involve the AS are found; however, any attempt to download element list to the AS would fail in this case. Note: This setting is relevant if Route Control is using its own redundancy control or when PCS 7 redundancy is used, see the setting Global Settings - General , Use PCS7 Redundancy.

Additional Settings

Global Settings

Global Settings - General

Global Settings - Material

Global Settings - Rules for the Route Algorithm

Additional Descriptions

Global Settings (Monitoring of Servers and AS)

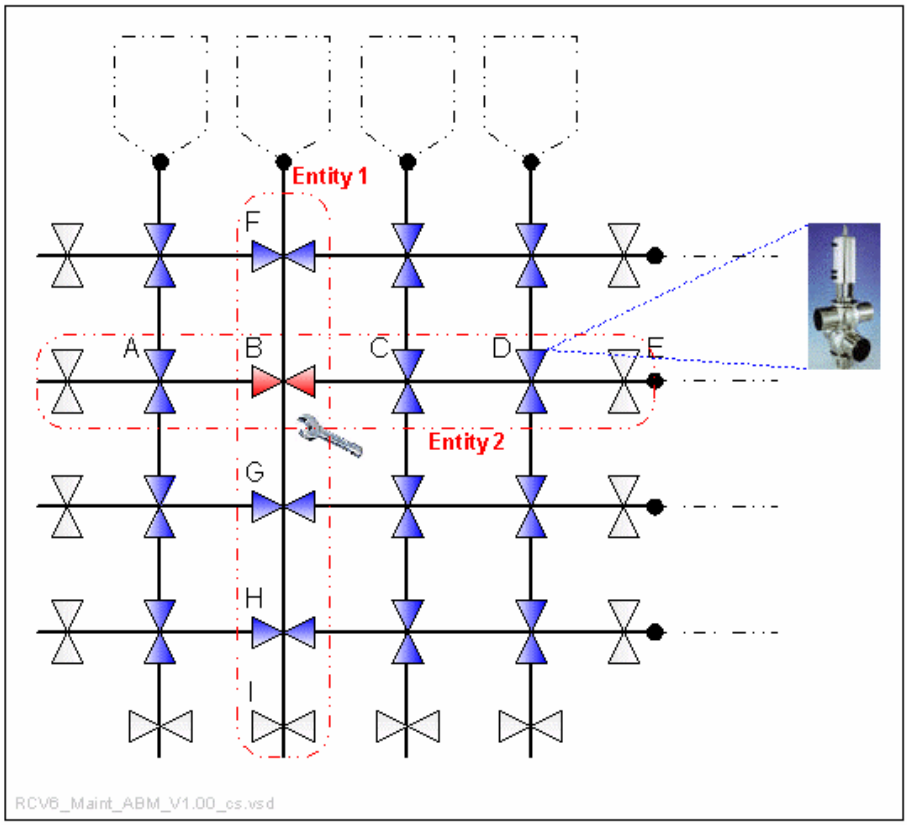
Global Settings (Information about 'Maintenance')

6.26.2.7 Global Settings (Information about 'Maintenance')

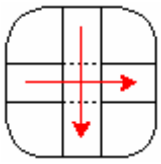
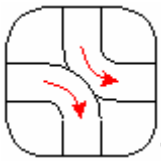
A practical example (a valve block with double-seated valves) will illustrate the differences between an 'element in maintenance' and an 'element affected by other elements due to maintenance.'

Note

The 'affected by maintenance,' or ABM, function has not yet been implemented in SIMATIC Route Control Version (entity concept).



If, for example, valve B is 'in maintenance,' then all valves of the entities in which valve B is involved are 'affected by maintenance.' Routes over valve B are not possible due to maintenance, and routes over the other valves in both entities are possible but are restricted. That is, routes that request a particular valve position but do not activate the valve are permitted, whereas routes that activate the valve (A, C, D, E, F, G, H, I) are not permitted, as this could cause material to be lost through the valve in maintenance.

Icon	Meaning
	Double-seated valve that does not have 'faulty' status
	Double-seated valve that has 'faulty' status
	Block valve or shutoff valve at the end of a pipeline
	Entity (a group of elements that logically belong together, valves in this case) Definition of an entity: All elements (valves) up to which product (or another material) can flow unobstructed. Two entities are drawn in here: Entity 1: valves B, F, G, H, I Entity 2: valves A, B, C, D, E
	Double-seated valve: possible material flow directions:  'Crosswise' material flow  'Diagonal' material flow Important: A 'locked valve position' is not available, and product flows cannot be combined.

6.26.2.8 Global Settings (Monitoring of Servers and AS)

The Route Control server or servers constantly monitor the connections to the automation systems and indirectly also the connection to the corresponding peer computer. Monitoring occurs in the following sequence:

1. The master computer sends a supervising telegram to each automation system
2. The automation system sends a response telegram to each server (master and standby)
3. Both servers have an internal timer (see 'Cycle time for server/AS monitoring' key)
4. If this time runs out before a response telegram has been received from the automation system, then a counter increases by one
5. If the counter reaches a certain limit (see 'Number of permissible missing monitoring telegrams' key), a failover of the servers occurs (redundancy case)
6. The server tolerance time is calculated from a combination of the 'Cycle time for server/AS monitoring' and 'Number of permissible missing monitoring telegrams'):
   Tolerance time (in seconds) = cycle time for server/AS monitoring (in seconds) x number of missing monitoring telegrams permitted
7. Automatic failover occurs only if it has been enabled (see 'Automatic failover of servers in the event of a fault')
8. If automatic failover is not enabled, then both servers become standby servers, and the user must perform the failover manually.

6.26.2.9 Configuration of a Route Control Server

See Route Control Wizard: Network Constellations

6.26.2.10 Configuration of a Route Control Server Pair (Redundancy)

See Route Control Wizard: Network Constellations

6.26.2.11 Route Log (Configuration)

The route log is available in RC V6.0 SP1 and higher.

A number of properties relating to the route log can be configured in the Route Control engineering tool.

No.	Property	Description
	Activate	Indicates whether the route log should be activated (X) or deactivated (-).
	Server storage path	Path for storage of route log files for the server in the form of "\\<computer name>\<share name>" See also Route Log (Directory Sharing)
	Standby storage path	Path for storage of route log files for the standby computer in the form of "\\<computer name>\<share name>" See also Route Log (Directory Sharing)
	Size of cyclic buffer	Specified in days

6.26.2.12 Route Log (Directory Sharing)

The directory in which the Route Control server stores the route log files is freely configurable.

a) Storage in the RC installation directory (default)

If you do not configure a path, the RC server stores the log files locally under <Route Control installation directory>\log, e. g....\Programs\Siemens\rcs\log.

b) Storage in a separate directory on the RC server

If you want route log files to be stored on the RC server computer, you must specify the path as \\<computer name>\<share name>, whereby <computer name> is the name of the computer on which the RC server process is running.

The directory must be accessible for the RC server (read + write access) as well as the RC route log application (read access only) (Windows user rights).

c) Storage in a directory on another server

If you want to store route log files on a server other than the RC server computer, you must also specify the path as \\<computer name>\<share name>, whereby in this case <computer name> is the name of the other computer.

Note

If you want to access the log files with the route log application from another computer, you as the user must ensure that the relevant directory is shared out on the computer on which the files are stored (Windows directory sharing). This applies to all three cases mentioned above.

6.26.2.13 Route Log (Loading Settings on the Server)

Like all other settings, these settings are made on the Route Control server by loading the Route Control project engineering. Refer to the general section about loading the Route Control server under Loading the Route Control Server. Remember to activate the project engineering via the Route Control Center after you have loaded it.

6.26.3 Objects

6.26.3.1 Plant Hierarchy

You can add additional process cells and units to the plant hierarchy in the Route Control engineering tool. Your process cell can either be based on Standard S88 (process cell and unit) or you can create the two levels according to your own definition.

The process cell and unit levels are taken from an S7 project; the instance name and name of the CFC chart in which elements are embedded are taken from the elements.

6.26.3.2 Locations

Locations are the start, intermediate, and end points of a partial route or route. They can be assigned to a process cell and unit or they can be configured independently of these levels.

Locations that you create below the units are referred to as plant-related locations (unit locations), as compared to general locations, which are not dependent on a unit.

For each location, it is possible to specify whether it may be used as a source location, an intermediate location (variant), and/or a destination location in partial routes. This specification determines the visibility of the location in the Properties dialog of a partial route. In this way, selection of particular locations in the plant as a source or destination for material transport can be prevented at the front end of the process.

Note

A variant is an "artificial, virtual" intermediate location used to divide a partial route into two paths. Because a variant (location) can never be at the beginning or end of a partial route, it cannot by definition be selected as the source or destination location of an entire route during runtime, since every entire route begins or ends with a partial route.

For this reason, when the "Variant" property is given to a location, both "Visible for selection as source/destination" properties are disabled and cannot be selected. Thus, variants can never be more than intermediate (via) locations in an entire route.

The terms "variant of a partial route" and "via location of an entire route" are not synonymous!

Please note below that the "Variant" option is a property of a partial route, whereas the "Visible for..." options only affect runtime visibility of an entire route (and not a partial route) in the Route Control Center!

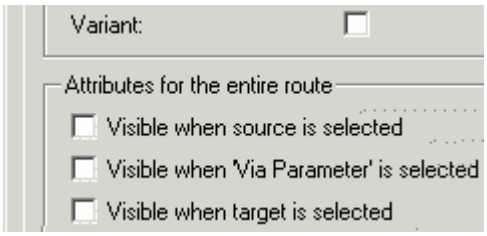
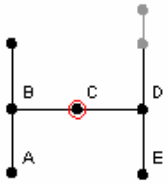
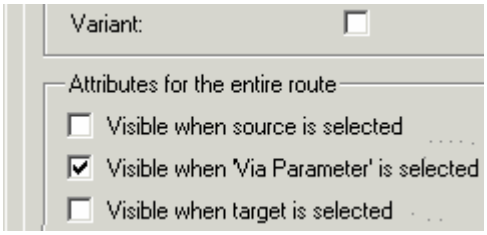
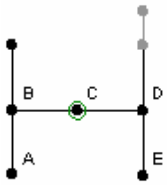
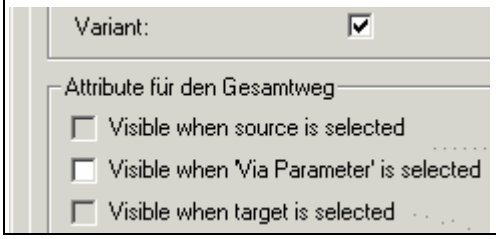
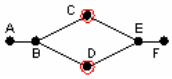
6.26.3.3 Locations (Properties Dialog)

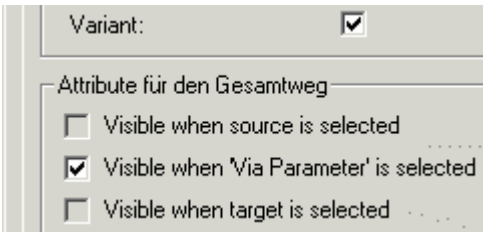
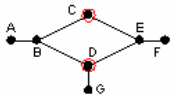
It is possible to specify the role a location should play with regard to a partial route or route:

- Use of a location as a variant (yes or no)
- Use of a location as a source, intermediate (via), or destination of an entire route

The variant property relates only to use of a location in partial routes, and thus to engineering, whereas the source, intermediate (via), and destination properties relate only to the entire route, that is, to the runtime system (selection in the Route Control Center).

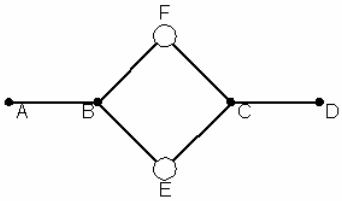
Examples

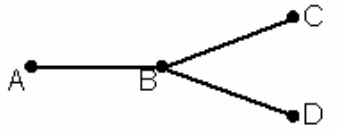
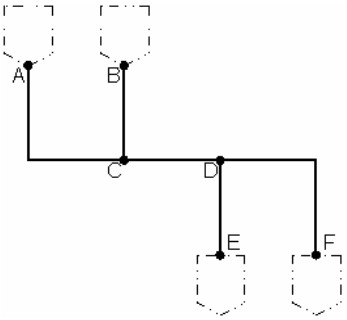
Location Properties	Example	Description
		The location is not a variant and cannot be selected during runtime. However, this is not an error, as the location can be selected as both the source and the destination of a partial route. It is also visible during project engineering, but not during runtime. Example: C cannot be selected as a via location, but it can be selected as a destination for partial route B-C and as a source for C-D
		The location is not a variant and can only be selected as a via location during runtime. The location can be the source or destination of a partial route. The location can only be a via location of an entire route. Example: As above, but C can be selected as a via location in this case
		The location can only be used as a variant of a partial route and is not visible during runtime. Example: C and D are only variants of the partial route B-E, but they cannot be used as a via location for a route.

Location Properties	Example	Description
		The location (here C or D) can only be used as a variant of a partial route. During runtime, the location is only visible as a via location. Example: D is a variant with regard to BDE and a via location to transport material from A to G BDE is a partial route A(BD)G is the entire route Therefore, D assumes both roles in this case BCE and BDE are variants of the partial route BE

6.26.3.4 Locations (Examples)

The following examples illustrate the implementation of practical use cases during project engineering:

Example	Route Network	Meaning ? Procedure
1		<u>Location inputs:</u> A: source, not a variant B: via, not a variant C: via, not a variant D: destination, not a variant E: via, variant F: via, variant <u>Project engineering of partial routes:</u> A-B: source A, destination B, variant empty C-D: source C, destination D, variant empty B-E-C: source B, destination C, variants (over) E B-F-C: source B, destination C, variant (over) F <u>Possible routes during runtime:</u> A-D A-D via E A-D via F

Example	Route Network	Meaning ? Procedure
2		Location inputs: A: source, not a variant B: destination and source, not a variant C: destination, not a variant D: destination, not a variant Project engineering of partial routes: A-B: source A, destination B, variant empty B-C: source B, destination C, variant empty B-D: source B, destination D, variant empty Possible routes during runtime: A-C A-D
3		Location inputs: A: source, not a variant B: source, not a variant C: not a via, not a variant, not a beginning or end location in an entire route; beginning and end location in a partial route D: not a via, not a variant, not a beginning or end location in an entire route; beginning and end location in a partial route E: destination, not a variant F: destination, not a variant Project engineering of partial routes: A-C: source A, destination C, variant empty B-C: source B, destination C, variant empty C-D: source C, destination D, variant empty D-E: source D, destination E, variant empty D-F: source D, destination F, variant empty Possible routes during runtime: A-E A-F B-E B-F

6.26.3.5 Unit Location Type

The procedure for entering the location type of a unit is the same as for *Route Control based on PCS 7 Version 5*.

Note

This part of the project engineering is subject to change, as the interface concept for SIMATIC BATCH has not yet been determined for Version 6! For the time being, do not include location types in Version 6.1 project engineering. They have been retained primarily for migration of existing projects in the engineering tool.

6.26.3.6 Transport Set Name

The transport set name describes the type of material transport procedure and was used in Route Control based on PCS 7 Version 5 in the context of interfacing with the BATCH system.

Note

This part of the project engineering is subject to change, as the interface concept for SIMATIC BATCH has not yet been determined for Version 6! For the time being, do not include transport set names (TSN) in Version 6.1 project engineering. They have been retained primarily for migration of existing projects in the engineering tool.

6.26.3.7 Mode Tables

Mode tables consist of 32 mode levels; you can select from mode level 1 to 32. A partial route is always assigned to a mode table. The mode table defines and limits the number of mode levels in elements of a partial route or an entire route during runtime.

6.26.3.8 Mode Levels

Mode levels constitute the finest level of granularity for activating a route. Activation of the elements when a route starts or deactivation when a route ends is not mandatory. Instead, individual groups are formed. An element can also be added to several mode levels with various commands.

The individual mode levels are independent of one another and are only connected by means of logic operations in the user program connected in the route. Therefore, mode levels can be activated and requested in parallel during runtime. Thus, in the following example, the "Pump on" and "Target container full?" mode levels can be activated simultaneously.

Note

Because the mode table is passed along when a route is requested, a route can only contain partial routes that are assigned to the same mode table.

Example:

"Initial state" mode level

- Checks whether all valves are closed, the pump is off, the source container contains enough material, and the target container has enough available space.

"Transport valves open" mode level

- The transport valves involved in the route are opened, the mode level is "satisfied" when all elements have reached their set position.

"Pump on" mode level

- The material transport pump is turned on

"Source valve open" mode level

- The valve on the source container is opened

"Target container full?" mode level

- The sensor on the target container provides a signal when the container is full. This feedback is continuously evaluated by the routing system.

Etc.

6.26.3.9 Automatic Generation of Elements

Note

The option to generate an entire range of elements has not been included in SIMATIC Route Control. Up until version V5 (PCS 7 and BRAUMAT), the Route Control Wizard did not exist, and there was no efficient way to transfer previously configured elements from CFC charts.

V6 provides a Route Control Wizard and is no longer based on BRAUMAT, thus eliminating the need to generate elements on the Route Control project side. However, it did result in a risk of inconsistent data between the Route Control project and the S7 project.

The CSV interface for exporting and importing elements has been limited to ensure that inconsistent data cannot be configured by means of this interface; refer to Interfaces: CSV File (Introduction).

6.26.3.10 Deleting Elements

An element can be removed from the list by means of the shortcut menu for the element or by pressing the Remove button when the element is selected.

6.26.3.11 Elements

In Route Control V6, control elements as well as other types of instances, such as sensor, parameter, and linking elements, are no longer created in the Route Control project. For consistency reasons, they are first inserted in CFC charts in the S7 project and then transferred to the Route Control project engineering using the Route Control Wizard.

Wizard

- Route Control Wizard: Actions
- Route Control Wizard: Selecting Objects To Be Exported

Element Dialogs

- Control Element (Properties)
- Sensor Element (Properties)
- Parameter Element (Properties)
- Linking Element (Properties)

6.26.3.12 Element Subtypes

In Route Control V6, control element types as well as other object types, such as sensor, parameter, and linking elements are no longer created in the Route Control project. For reasons of consistency, these elements are first created in the S7 project as blocks with a particular ID, then placed as instances in CFC charts, and finally transferred to the Route Control project engineering using the Route Control Wizard.

See Example of a User-Defined Type.

6.26.3.13 Predefined Routes

This functionality is no longer included in SIMATIC Route Control V6.

6.26.3.14 Interconnecting an Element

To insert an element in a partial route, select the object in the top section and insert it into the partial route in the bottom section using a drag-and-drop operation.

A dialog box will open, and you can set the properties for the inserted element:

- Mode level in which the element is to be inserted/enabled/requested
- Command value, for example, Switch on motor, Close valve, etc.
- Passive use: the element is only requested but not activated in the mode level
- Monitoring of rest position: the element is also monitored while in disabled status (mode level is not activated) to determine whether it moves out of its desired position
- Pulse time on/off: duration of the on and off signals, in seconds
- Delay time on/off: duration of the on and off signals, in seconds. Elements can be switched on or off with a delay relative to enabling or disabling of their mode level (for example, motor coasting or valves with delayed closing, etc.)
- In the first tab, you can also select another element from another AS. This is useful because you do not have to close the dialog box first to select a new element.

Confirm your settings with OK, and the element will be assigned to the partial route with the selected properties. If you press Cancel, you prevent the insertion, and cancel the procedure.

6.26.3.15 Partial Routes

Partial routes are objects that do not exist in SIMATIC Manager; only the RC engineering tool is used to create and assign parameters to partial routes. Partial routes always have a source location and a destination location, and they can have an optional transition location (variant). These locations can either be plant-related or plant-neutral.

A mode table and one or more elements are assigned to a partial route. The sum of the partial routes forms the route network of the plant.

If several partial routes have the same source and destination locations, they cannot be distinguished during a search using these parameters. For this reason, the variant is included as additional, optional information. Variants specify various alternative partial routes.

Example:

Partial route A >> C via B

Partial route A >> C via D

You can specify for a route search whether partial routes are to be used as:

- Unidirectional partial routes (default setting)
- Bidirectional partial routes

There are generally more possible route combinations for bidirectional partial routes, and therefore there is a risk that circular routes or undesired routes could be found.

The IDs are displayed to help you when selecting the source, variant, and destination locations of a partial route.

The Priority parameter forces the search algorithm to prefer a particular partial route during runtime if several route options exist. In this case, 1 corresponds to the highest, and thus preferred, priority. Therefore, when a priority is specified, certain partial routes are weighted differently.

The following are typical criteria for weighting:

- Length of pipeline
- Number of elements in the route
- Preference for particular elements, such as pumps that were not used as heavily

6.26.3.16 Routes

Actual routes, i.e., routes as aggregations of partial routes, are not configured; however, the resources (the route IDs in this case) must be allocated because the Route Control system (server) needs to know which AS is working with which route IDs:

- Allocation of route ID to AS (can also be taken from an S7 project)
- Indication of which route IDs are permanently assigned to particular routes and which IDs are available for dynamic ID allocation

Thus, route IDs are suitable for allocation to the automation systems involved in the routing system (areas).

6.26.4 Materials

6.26.4.1 Material (Overview)

Materials are involved in several areas of SIMATIC Route Control:

- Materials and material groups are configured in the RC engineering tool
- Relationships to the permissible successor materials are also defined in the RC engineering tool
- During runtime, the user program can transfer a desired new material prior to a route request; this material is then taken into consideration for the route search, that is, it is checked to determine whether or not it is permissible as a successor material.
- The RC server verifies whether the new material is a suitable successor for the material that was transported previously. If the new material is not permissible, then a route is not found if an alternative path is not available!

Project engineering of materials is presented in the following sections.

Note

Material data can also be specified during runtime on the Route Control server. For more information, see Material Interface

6.26.4.2 Project Engineering of Materials

The input dialog is opened using the Tools \ Material \ Configuration menu command.

See Project Engineering of Materials and Material Groups

6.26.4.3 Project Engineering of Material Groups

Open the same input dialog as for materials using the Tools \ Material \ Configuration menu command. See Project Engineering of Materials and Material Groups

6.26.4.4 Project Engineering of Permitted Successor Materials

In many industrial sectors, certain materials may not succeed each other or use the same transport route. For example, in the brewery industry, beer product must never follow an acid cleaning step directly, but must always be preceded by a water flush. For this reason, the routing system provides a parameter assignment option for material compatibility and material sequencing. Information about the material currently being used in a particular partial route is stored temporarily in an interconnected linking element. The routing system uses this information to determine whether the successor material is permitted.

See Project Engineering of Material Sequences

6.26.5 Exporting into the Server

6.26.5.1 Loading the Route Control Server

First-Time Loading of the Route Control Server

Use the following procedure the first time you load the Route Control project engineering:

- Start the Route Control server (Windows start menu: Start \ Simatic \ Route Control \ Server)
- The Route Control server will attempt to read in a project engineering configuration; because one does not yet exist, it will go into error status,
- Now load the Route Control project engineering on the server (using the Route Control Engineering tool)
- Open the Route Control Center and the server status dialog (View \ Server Status)
- Press "Update" while the server is still in error status.
- Now restart the Route Control server,
- The Route Control server will now find the project engineering and should start up without errors the second time.

Updating (Subsequent Loading of) the Route Control Server

If you make changes to a Route Control project, you must carry out two more steps in order to transfer it to the Route Control server and activate it.

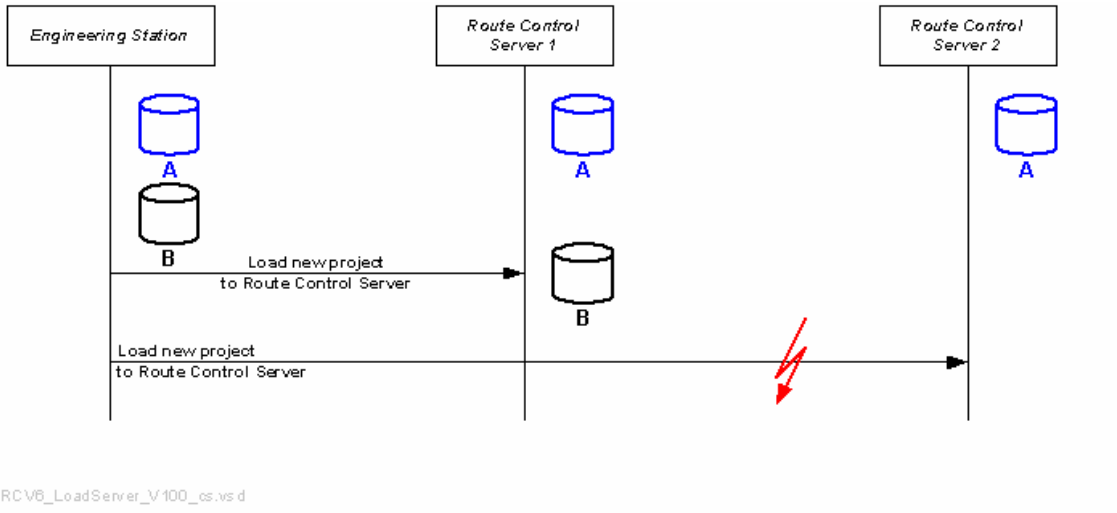
- Load the Route Control project engineering to the server (preparation, changes are not yet effective!) from the Route Control engineering tool.
- Enable the changes by making selections in the Route Control Center (Enable changes) using the View \ Server Status menu command followed by "Update" in the dialog box

6.26.5.2 Case 1: Server 1 Can Be Loaded but Not Server 2

The project engineering can only be loaded onto Route Control server 1 from a project engineering station.

System action:

Both Route Control servers attempt to synchronize the project engineering on both sides. As soon as this is possible, project engineering B is copied to server 2, but not yet activated.



6.26.5.3 Case 2: Server 2 Can Be Loaded but Not Server 1

Same action as in case 1, but server 1 and 2 are switched

6.26.5.4 Case 3: Both Servers Can Be Loaded

Same status as following synchronization of case 1 and case 2, see:

Case 1: Server 1 Can Be Loaded but Not Server 2 and

Case 2: Server 2 Can Be Loaded but Not Server 1

6.26.5.5 Case 4: Neither Server Can Be Loaded

This involves a two-fold error when downloading the server. The system cannot update any database. The user must correct the error (set the share attribute for the directory on the server computer, for example) and start the download again.

6.26.6 Checking Data Consistency

6.26.6.1 Route Control Engineering: Checking Data Consistency

File Name

RC_CONSISTENCY.LOG

File Location

The log file is stored in the same path where the Route Control project database is located. See Storage of Route Control Project.

File Segments

Check log:

1. S7 project name: Name of S7 project containing the Route Control project
2. S7 project path: Path to the S7 project
3. RC project name: Name of Route Control project (database file name)
4. RC project path: Path to the Route Control project
5. User: User who initiated the export operation
6. Check date: Time stamp indicating date of consistency check

Options:

7. Settings selected by the user
8. ID conventions: Yes/no
9. Sorting order: Yes/no
10. Variant check: Yes/no
11. Activation of elements: Yes/no

Checking of ID conventions:

12. The IDs are checked for uniqueness within the range of validity in every automation system.
13. Because the Route Control Wizard has already assigned and checked the IDs according to these rules, no more errors should occur here.

Checking the sorting order of the elements:

14. Checks that the element numbers are in ascending order within the partial route modes.

Variant check:

15. See Locations (Properties)

Checks commands for elements:

16. Checks to determine whether an element command exists at all in the element type in a partial route.

6.26.7 Mode Levels

6.26.7.1 Project Engineering of Mode Tables

What are Mode Tables?

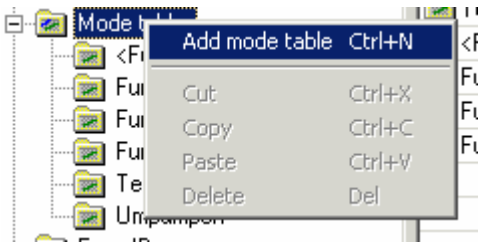
Mode tables are basically objects that group together associated process-related mode levels.

Example

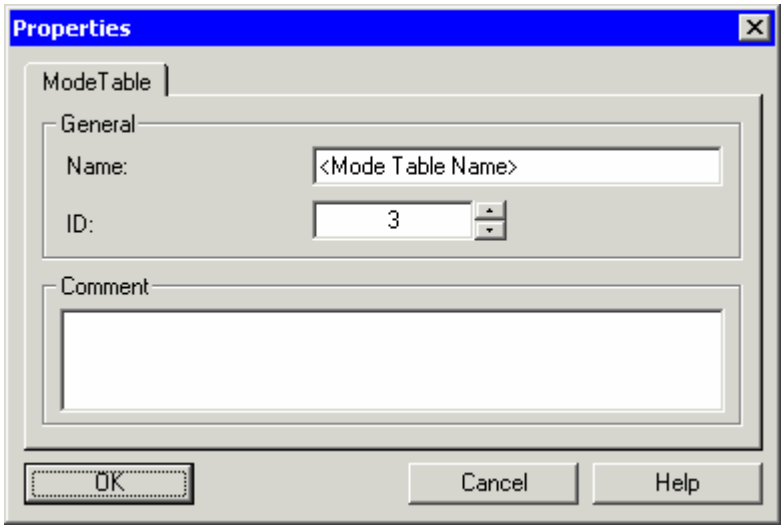
	"Production" Mode Tables	**"Production" Mode Tables**
Mode level 1	Check initial state	Check initial state
Mode level 2	Is source tank full?	Is cleaning agent available?
Mode level 3	Open transport valves	Transfer cleaning agent
Mode level 4	Switch on product transport	Deactivate cleaning
Mode level 5	1.Is destination tank full?	---
Mode level 6	Select second destination tank	---
Mode level 7	2.Is destination tank full?	---
Mode level 8	Switch on ventilation	---

Project Engineering of a Mode Table

1. In the engineering tool, select the "Mode Tables" folder.
2. In the shortcut menu, select "Add Mode Table."



3. Assign a name for this mode table.



4. Confirm with OK

6.26.7.2 Project Engineering of Mode Levels

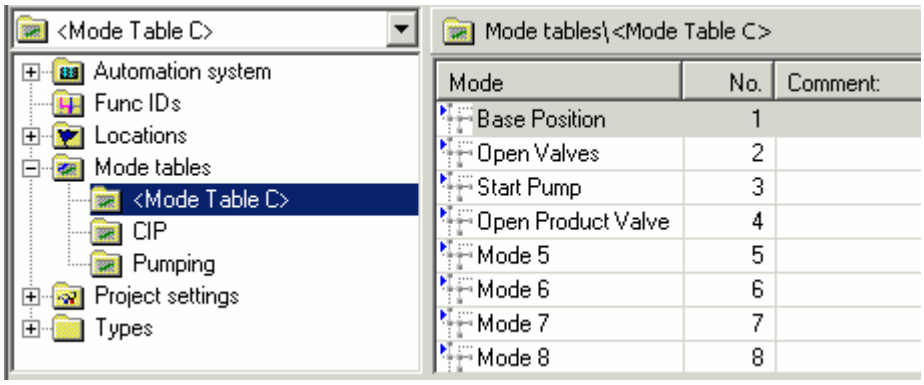
What are Mode Levels?

Mode levels are fine gradations used to control a route, that is, the elements of a route. In a technological process, it is not enough to merely enable a material transport and then terminate it after a certain period of time has elapsed or a particular quantity of product has been transported. Rather, a number of conditions must be taken into account:

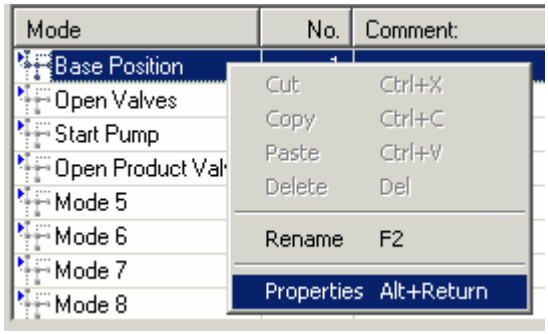
- Certain valves not directly located on the transport route must be closed to prevent the product from following an incorrect route.
- Elements such as manual valves and ventilators are activated separately in response to conditions such as a temperature increase.
- During transport, the transport valves are opened first while the discharge valve on the source tank remains shut. This discharge valve is then opened and the pumped switched on only after the transport valves have attained their set position.
- Fill levels are scanned in the source and destination tanks, and the transport switches to new source or destination tanks as required.

Project Engineering of a Mode Level

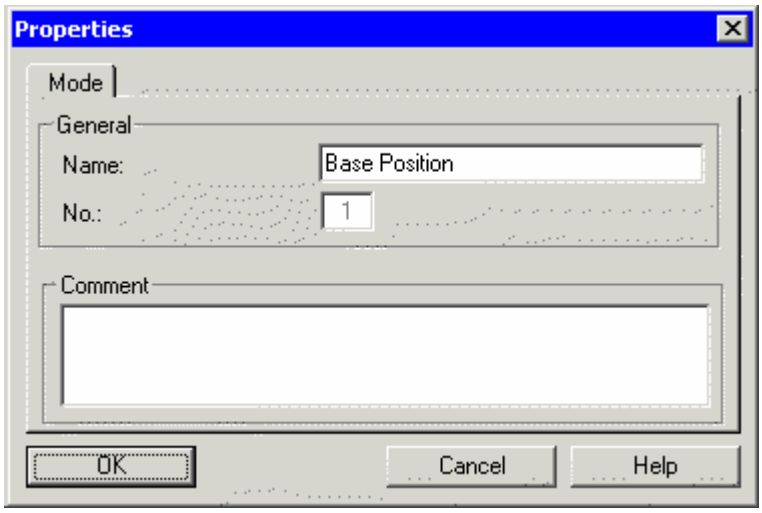
When you created the mode table, you also created 32 mode levels. Therefore, rather than creating a new mode level, you can modify the existing ones:



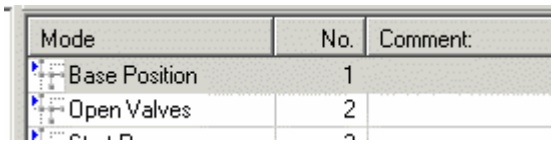
1. Open the Properties dialog for a mode level (in the shortcut menu of the mode level in a mode table).



2. Assign a new name to the mode level.



3. Confirm with OK



6.26.8 Partial Route Network

6.26.8.1 Project Engineering of Partial Routes

What are Partial Routes?

Partial routes are the smallest sections of a route network (pipes, conveyor belts, etc.) in terms of a routing system. Partial routes have a start location, an end location, and possibly an intermediate location (variant). However, do not confuse the intermediate location of a partial route with the via parameters of a route.

Elements (such as motors, valves, parameter elements, sensors, and linking elements, etc.) are assigned to partial routes.

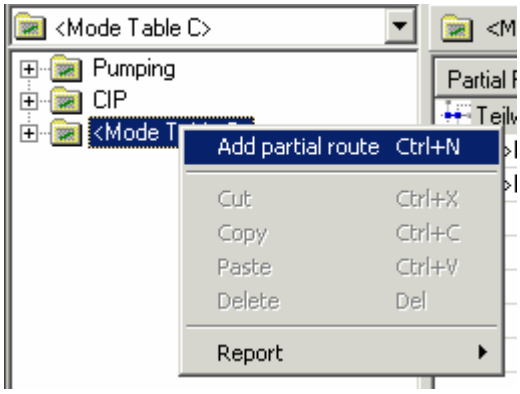
During runtime, an entire route is requested, whereby the start and end locations of the entire route, among other things, are included in the request. Using these specifications, the Route Control server applies an appropriate algorithm to search for the shortest possible path through the route network. (The route network comprises all partial routes.)

Requirement

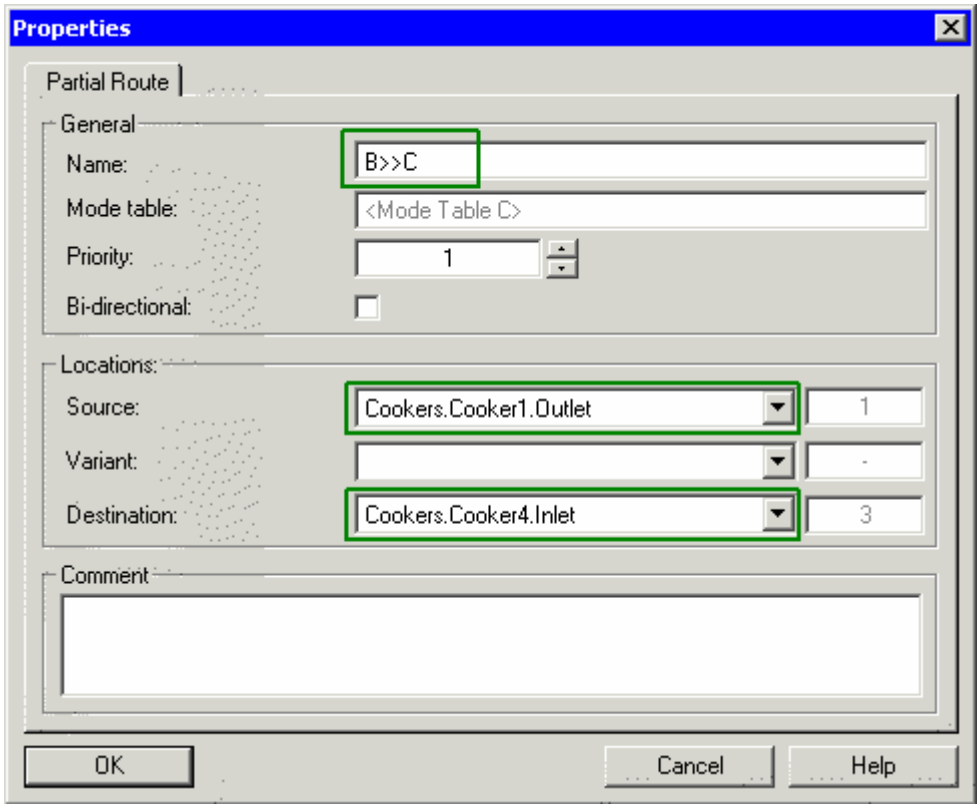
The locations must already be configured, because a partial route can only be created if a start location and an end location are assigned to it. (Otherwise, it is not possible to exit the Properties dialog of the partial route by clicking OK.)

Project Engineering of a Partial Route

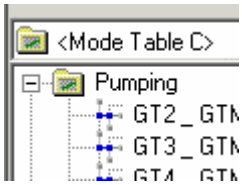
1. Select "Add Partial Route" in the shortcut menu of the mode table located in the lower section of the engineering tool.



2. Give the partial route a name, such as "A>>B" or "MaltHopper001>>Scale"
3. Select a source and destination location for the partial route - selecting a location for the variant is optional



4. Confirm with OK



6.27 Project Engineering of RC Faceplate

6.27.1 WinCC Faceplate

The Route Control faceplate is interconnected with an instance of block type RC_IF_ROUTE, enabling it to support a WinCC faceplate wizard for Route Control.

For instructions on how to insert and interconnect the Route Control block icon in WinCC with a route instance, refer to Route Control: WinCC Wizard (Overview).

You will find a description of the individual interface dialogs in Dialogs.

For an overview of the relationships between an SFC, a route, and operator dialogs, refer to Guide: Relationship between SFC and Route, Including Operator Dialogs

6.28 Project Engineering of RC Center

6.28.1 Configuration of the Route Control Center

For an overview of the relationship between an SFC, a route, and operator dialogs, refer to Guideline: Relationship between SFC and Route, Including Operator Dialogs

6.29 Project Engineering of RC Server

6.29.1 Configuration of Route Control Server

The plant network used for Route Control and the properties of the Route Control server are configured with the Route Control Wizard.

See Route Control Wizard: Actions

A number of settings that affect the action of the Route Control server are defined in the Route Control project engineering.

See Global Settings

6.29.2 Loading the Route Control Server (Redundancy)

The following four cases exist for loading a new project engineering to the Route Control server (without activation):

1. Server 1 can be loaded but not server 2 (because it is inaccessible or the path is not properly shared, etc.)
   See Case 1: Server 1 Can Be Loaded but Not Server 2
2. Server 2 can be loaded but not server 1 (because it is inaccessible or the path is not properly shared, etc.)
   See Case 2: Server 2 Can Be Loaded but Not Server 1
3. Both servers can be loaded
   See Case 3: Both Servers Can Be Loaded
4. Neither server can be loaded
   See Case 4: Neither Server Can Be Loaded

When the Route Control Center is started (or if it is already open, when this function is called from the menu), it checks to determine whether the Route Control server to which it is connected has a new project engineering B that could be activated.

The Route Control Center prompts the user to activate the project engineering. If the user cancels the operation, the project engineering is not activated. However, if the user confirms the operation, project engineering B is activated and replaces project engineering A. The Route Control server then restarts to read in the new project engineering.

If the Route Control Center does not find a different project engineering, the user does not receive a prompt.

Thus, the load operation to the Route Control server is successful if the project engineering can be loaded onto at least one of the two servers.

6.29.3 External Material Interface

6.29.3.1 Material Interface

Overview

You the user have three options:

- Route Control without material configuration or material check
- Route Control with internal material configuration and material check
- Route Control with external material configuration and material check

Without Material Configuration

The default setting is a new Route Control project engineering without material configuration and with a runtime check.

Internal Material Configuration in the Route Control Engineering Tool

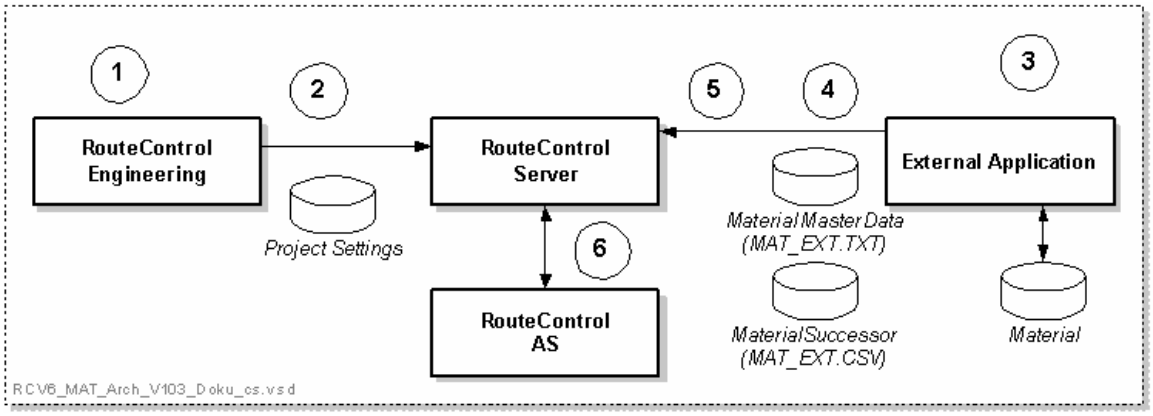
The first time a material configuration is created, the system indicates that an ID is being set simultaneously for the use and verification of materials in Route Control; see also Configuration of Materials.

External Material Interface on the Route Control Server

The material interface on the Route Control server was created to enable application of external master data in Route Control. If the Route Control server has a redundant configuration, the data only need to be loaded onto one of the computers, and the two servers will be synchronized automatically.

The interface was kept simple so that it can be supplied with already existing customer applications. Two files (MAT_EXT.TXT and MAT_EXT.CSV) are transferred on the interface. See also Material Interface (Architecture)

6.29.3.2 Material Interface (Architecture)



1. A setting in the Engineering Tool specifies whether internal (Engineering Tool) material configuration, external (RC Server) material configuration, or no material configuration is to be used. These three settings are mutually exclusive. → Selection of "External Material Configuration"
2. This setting is loaded on the Route Control server from the Engineering Tool within the context of the project load procedure and activated via the Route Control Center.
3. In an external configuration application, material master data and successor relationships are configured.
4. These material master data and successor relationships are placed in the transfer directory (two files: MAT_EXT.TXT and MAT_EXT.CSV).
5. The Route Control server detects changes in the transfer directory and reads in the data. Activation via the Route Control Center is not required.
6. The new data will be taken into account during the next route request.

Note

Loading of a new material configuration is recorded in the route log.

6.29.3.3 Material Interface (Transfer Files)

Two files are transferred on the interface (directory sharing of RC_LOAD on the RC server):

- Specification of material master data (MAT_EXT.TXT)
- Specification of material successor relationships (MAT_EXT.CSV)

Note

These files are only read in automatically by the Route Control Server if the first line (signature) matches in both files! This prevents inconsistent relationships, i.e., inconsistent successor and material master data settings, from occurring.

6.29.3.4 Material Interface (Material Master Data)

The MAT_EXT.TXT transfer file is in normal text format (ASCII) and has the following structure:

<project name>;<GMT string>;<GMT number>

Material 1

Material 2

...

Material 1024

Example:

Fermentation and Storage Cellar; 2004-12-01 15:34; 2746388496

Lager_Light

Lager_Stout

Yeast

...

Note

It is not necessary to fill in all 1,024 lines with material names.

6.29.3.5 Material Interface (Successor Relationships)

The second transfer file (MAT_EXT.CSV) contains information about which materials are allowed to follow other materials. The general file structure is as follows:

<project name>;<GMT string>;<GMT number>

<SR1.1>;<SR1.2>;<SR1.3>;...;<SR1.1024>

<SR2.1>;<SR2.2>;<SR2.3>;...;<SR2.1024>

...

<SR1024.1>;<SR1024.2>;<SR1024.3>;...;<SR1024.1024>

Example:

Fermentation and Storage Cellar; 2004-12-01 15:34; 2746388496

1;0;0

1;1;1

0;1;1

A 1x1 to 1024x1024 matrix is specified in each instance; SRx.y stands for successor relationships between the predecessor material x and the successor material y.

The successor relationship is specified with:

- 0 if the material is not permitted as a successor material
- 1 if the material is permitted as a successor material
- -, if the configured global setting should be used; see Global Settings - Material

6.29.3.6 Material Interface (Example)

Three materials are to be transferred as master data (water, detergent, product) with the following applicable successor rules:

1. Water may only follow detergent.
2. Detergent may follow product and water.
3. Product may only follow water and may not directly follow detergent.
4. Of course, each material may be followed by more of the same material.

Structure of Material Master Data File (MAT_EXT.TXT):

Fermentation and Storage Cellar; 2004-12-01 15:34; 2746388496

Water

Detergent

Product

Structure of Successor File (MAT_EXT.CSV):

Fermentation and Storage Cellar; 2004-12-01 15:34; 2746388496

1;1;1

1;1;0

0;1;1

1;1;1 → All three materials may follow water

1;1;0 → Only water and detergent, but not product, may follow detergent

0;1;1 → Detergent and product, but not water, may follow product

6.29.3.7 Material Interface (Test)

Execution of a route request is now recommended to check the data that have been loaded.

1. Force the predecessor material to be applied to the route via the Route Control Center.
2. In the Route Control Center, select a route and specify a source, a destination, and the current (successor) material. Now perform a route request, but do not start the route (yet).
3. Evaluate the result. If a material error occurs, this will be indicated in the Route Control Center. Check these results against the configuration.

7 OS Operator Control and Monitoring

7.1 Overview

Operator control and monitoring of the objects relevant to Route Control can be performed using:

RC block icon for a route:

RC Block Icon for a Route

RC Block Icon (Display Elements)

RC faceplate for a route:

RC Route Faceplate

RC Faceplate (Display and Operator Control Elements) - 1/4

RC Faceplate (Display and Operator Control Elements) - 2/4

RC Faceplate (Display and Operator Control Elements) - 3/4

RC Faceplate (Display and Operator Control Elements) - 4/4

RC Center for one route or multiple routes:

Route Control Center

RC server:

Server (Overview)

Startup Sequence

Route Control Server Status

Redundancy Failover

7.2 Using the WinCC Keyset to Call the RC Center

WinCC Keyset

Description

You can use the Route Control Center key in the WinCC keyset to call the Route Control Center. The route ID is not transferred in this case, so the Route Control Center displays all routes (as is the case when the Route Control Center is called via the Windows start bar).

7.3 Server

7.3.1 RC Server: Overview

If the Route Control server has not yet been started, it can be called up from the Windows start menu: **Start > SIMATIC > Route Control > Server**.

If the Route Control server is already running but has been minimized, it can be opened using a small icon in the taskbar.

For a description of the dialog user interface, refer to RC Server: User Interface Dialog

Use the shortcut menu to switch from one language to another; see RC Server: Switching Languages

7.3.2 RC Server: Startup Sequence

A Route Control server has dependencies on the following other components:

- WinCC message server (IAlarmData interface and ACE communication)
- Redundancy control

Therefore, the startup sequence below should be followed:

1. Start WinCC Runtime so that the message server is available
2. Redundancy control (automatically enabled with WinCC, when utilized)
3. Route Control server (startup list in WinCC or manually by means of the Windows start bar)

The sequence should be reversed to shut down an RC server.

Note

The following file should be called to start the RC server:
<Installation path>\Siemens\rcs\bin\RC_SERVX.EXE, e.g.
C:\Program Files\Siemens\rcs\bin\RC_SERVX.EXE

7.3.3 RC Server: Status

The Route Control server can have the following statuses:

Start:

The Route Control server application (EXE process) is starting.

Started:

The Route Control server is running as a process, but is not executing any actions. The Route Control server has started and is now waiting for initialization to be enabled by the activation controller.

Initialize:

The Route Control server is being initialized, that is,

- Establishing a connection to the redundancy control
- Establishing a connection to the WinCC alarm logging (message OS)
- Establishing connections to the configured automation systems relevant to Route Control
- Reading in the user project engineering (route network, elements, etc.)
- Determining which server will be the master and which server will be the standby, unless this information was already provided to the redundancy control during logon
- General request to all Route Control automation systems (on the master only)

Initialized:

The Route Control server is initialized and is now waiting for the activation to be enabled by the activation controller.

Activate:

Telegram processing will be activated (enabled) on the master only.

Activated (master):

The Route Control server is active and is processing telegrams from the AS. Route Control clients (Route Control Center) can connect to the server and exchange data.

Activated (standby):

The Route Control server is active, but as a standby; it cannot process any route telegrams from the AS. It is prepared to assume the master function in an emergency or as a result of a manual failover. Redundancy monitoring is active.

Deactivate:

Telegram processing will be interrupted in the master.

Deactivated:

The Route Control server is deactivated; no telegrams will be processed.

Uninitialize:

The Route Control server will be shut down:

- Connections to the AS will be closed.
- The connection to the WinCC message server will be removed.
- The connection to the redundancy control will be terminated.

Uninitialized:

The Route Control server is not initialized, only the EXE process is running, and no activity is taking place. The server is waiting for the activation controller termination signal.

Terminate:

The Route Control application (EXE process) will be terminated and removed from the main memory.

Special case error:

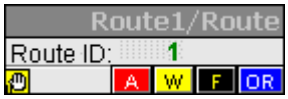
A Route Control server can switch to error status from each status indicated above. The server (EXE) must then be restarted.

7.4 RC Block Icon for a Route

7.4.1 RC Block Icon for a Route

Block Icon for a Route

The block icon displays the main states of a route.



Route Name

The name of the route is displayed in the header line; it is the instance name of the block in the CFC chart of type RC_IF_ROUTE to which this faceplate was interconnected.

Route ID

The route ID used to operate this route is displayed in this line.

0:	A route ID has not yet been assigned for this route
1.to 300:	Route ID for this route

7.4.2 RC Block Icon (Display Elements)

Route Status

Picture	Meaning
	Route is idle and inactive (automatic mode)
	Route is idle and inactive (manual mode)
	Route request is active (automatic mode)
	Route request is active (manual mode)
	Route is active and running (automatic mode)
	Route is active and running (manual mode)
	Route is held (automatic mode)
	Route is held (manual mode)
	Route is in error status (automatic mode)
	Route is in error status (manual mode)

Pending Messages (Group Display)

General	RC	Meaning
		One or more alarm messages are pending for this route
		One or more warning messages are pending for this route
		One or more error messages are pending for this route
		One or more operator input prompts are pending for this route

Route Control does not issue this type of message.

7.5 RC Faceplate (Client)

7.5.1 RC Block Icon and Faceplate

Route Control offers three user interfaces for operator control and monitoring of a route and its elements:

Route Control Block Icon

The block icon is interconnected to a route block using a Route Control dynamic wizard for WinCC. The block icon displays the main properties of a route during runtime.

RC Block Icon for a Route

Route Control Faceplate

The faceplate can be opened from the block icon to obtain a detailed diagnosis of the route. For example, the faceplate displays the source and destination of a route.

RC Block Icon and Faceplate

Route Control Center

You can open the Route Control Center from the faceplate to display the elements of the route and their status.

Route Control Center

7.6 RC Center (Client)

7.6.1 RC Center (Client)

The Route Control Center provides information on a route and its elements. The user interface of the Route Control Center is divided into two areas. The upper area displays the data for a route. If more than one route uses the same function ID (indicating overlapping material transports), all of these routes are displayed as the data are relevant to all of the routes involved.

If the RC Center is started from the Windows start bar and not from WinCC, all routes are displayed, because the current route ID is not known. If the RC Center is started from a WinCC picture by means of the Route Control faceplate, only the route associated with this faceplate is displayed.

There are two views in the lower area. On the first tab, the elements of the route selected in the upper area are displayed in lines. The mode levels possible for this route are listed horizontally, that is, all of the mode levels resulting from the elements involved in the route. Mode levels not involved are hidden.

While the initial tab is used to obtain a general overview, the second tab displays all of the route elements including the set position and actual position.

7.6.2 RC Server: Redundancy Failover

Failover of the two redundantly configured Route Control servers is carried out from the Route Control Center. Suitable authorization is required.

7.6.3 RC Support for Maintenance Work

To ensure safe maintenance work on the automation system, SIMATIC Route Control as of Version V6.1 provides an overview of the material transports in connection with *those* automation systems that are controlling them. You as the user can trigger a specific request to an automation system to set it "in maintenance". First, ongoing material transports that affect this automation system are completed - no new routes are allowed by the system, however. All routes are eventually completed and the automation system goes "in maintenance" as soon as the final route is completed. Now the maintenance personnel can perform the required updates and changes to automation system and then restart the system.

For a description of the operator control element in the Route Control Center, see AS in Maintenance

7.6.4 AS in Maintenance

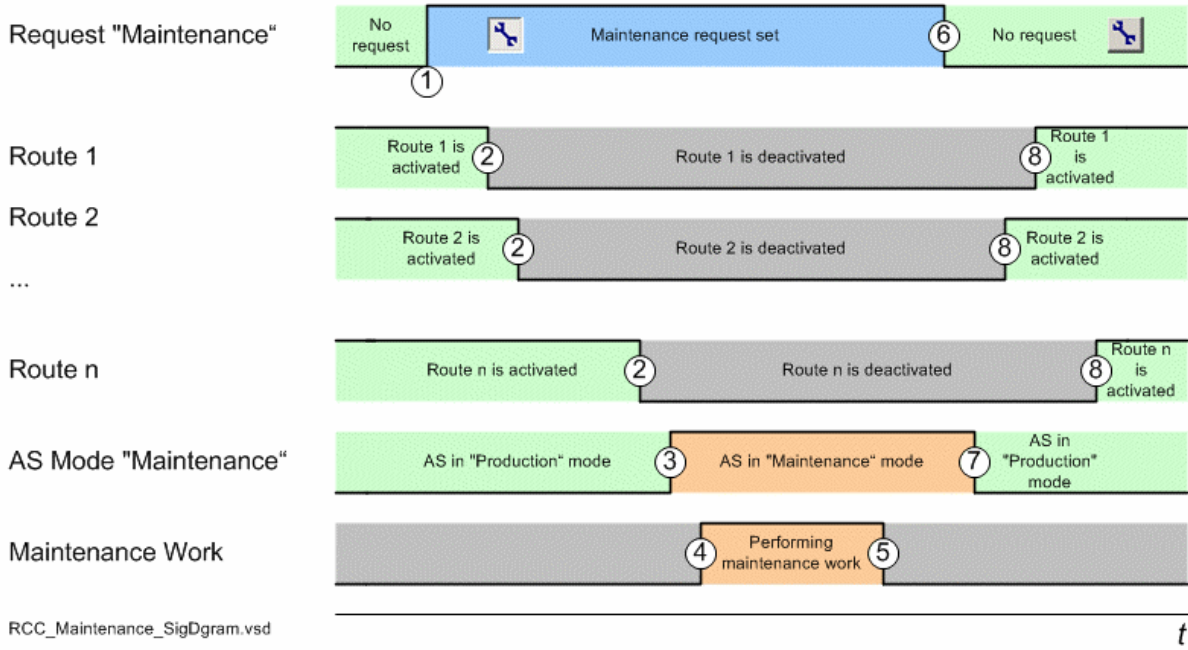
Route Control V6.1 supports the user in maintenance of an AS. There are several reasons when an AS has to be set to the "Maintenance" mode, for example, to update individual blocks or all the blocks of the AS (initial download when hardware is replaced).

Since an AS route can be controlled actively as well as participate passively in the route (as a slave), an AS cannot simply be stopped. This might lead to loss of the product in the system. Therefore, you should keep to the following steps:

1. User request for the "Maintenance" mode – see Route Control Center: Maintenance View
2. The system stops after all active routes are completed and does not permit any new routes. You as the user can intervene and manually complete the routes or stop them.
3. Once all routes have been completed on this AS, the Route Control AS goes to the "Maintenance" mode.
4. Now perform the desired changes to this AS (replace hardware and/or software, etc.)
5. The maintenance work is completed.
6. The maintenance request is rescinded in the RC Center – see Route Control Center: Maintenance View
7. As soon as the AS is back in "Production" mode...
8. Routes (material transport) can be started again

At each transition from "Production" to Maintenance" mode and back, a message is triggered by the alarm system (OS status message of the RC server – see Route Control OS Messages (System, Server)).

The following figure shows the response as a signal curve:



7.7 RC Routes Log

7.7.1 Route Log

The route log is available in RC V6.0 SP1 and higher.

The route log contains all of the information concerning material transport processes:

- Route status: Start, Stop, Hold, Restart, Error
- Activation and deactivation of modes
- Information about starting up and shutting down the Route Control server

Every day, the Route Control server creates a log file (readable text file) that can be opened with a separate "Route Log Interface" application.

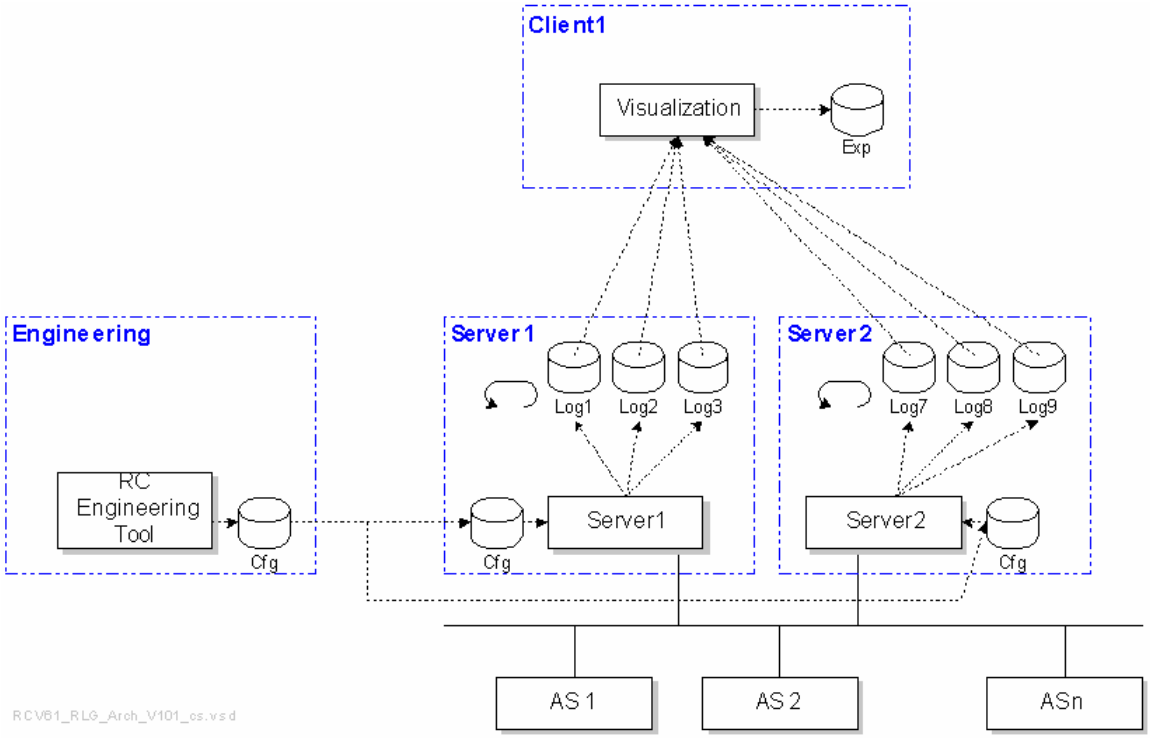
This application provides the following options:

- Filtering according to specific columns, e. g. the batch name or source or the material transport destination
- Searching for specific texts in columns
- Exporting the filtered result to a CSV file, which can then be edited and evaluated with other media, such as Microsoft Excel.

The next section provides an overview of route log architecture.

Route Log (Architecture)

7.7.2 Route Log (Architecture)

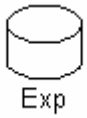


Depending on the project engineering, the Route Control server will create route log data in files either with a cyclic buffer or continuously. The factory settings provide a 30-day cyclic buffer. If not configured otherwise, the log files are stored in the Route Control server directory under...\Programs\Siemens\rcs\log.

The route log interface is used to open these files, even from another computer, such as a client computer. However, the user can also copy the files and work from the copies.

Note

Opening log files from another computer can inhibit performance, especially if relatively large files are transferred.

Icon	Meaning
	Configuration file Settings are made in the Route Control engineering and then loaded and activated on the Route Control server.
	Log file One or more files, depending on the setting. Each Route Control server creates its own log files (file extension is txt).
	Export file Optionally, route log data can also be exported and edited and evaluated with external media. File extension is CSV.
	Cyclic buffer Unless configured otherwise, the Route Control server uses a cyclic buffer for the logs. Each day, a new file is created, and logs are available from the last 30 days, according to the default setting.

7.8 Server

7.8.1 Route Log (Log File)

When the Route Control server is restarted, e.g. because the project engineering has been activated by means of the Route Control Center, it applies the new settings and stores a new log file during startup.

The log file names have the following format:

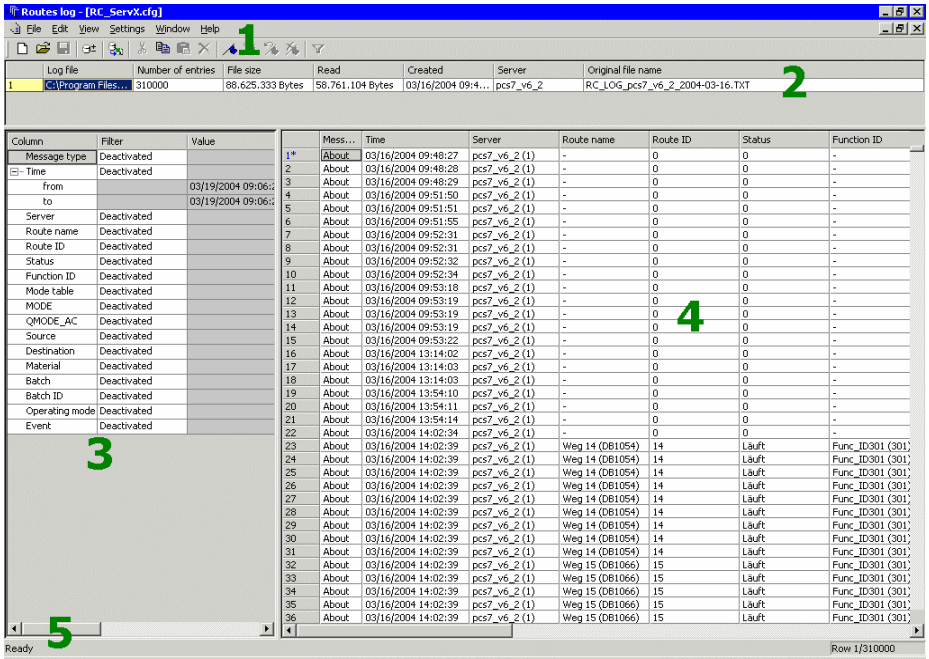
RC_LOG_<server computer name>_YYYY-MM-DD.TXT

<server name> is the name of the computer, YYYY-MM-DD is the year, the month, and the day on which this file was created. Because a new file is created each day, the file name indicates the day associated with this log.

7.9 Client

7.9.1 Route Log (Interface)

The route log interface is a standalone application provided for displaying, evaluating, and saving route logs.



Note

This is a view-oriented application, i.e., as the user, you first create a frame, the view, and then you open the log files inside this view. View properties include whether columns are to be shown or hidden; whether or not the current log data should be read in again when a view is opened, etc.

This application is divided into five areas:

1. Menu
2. List of log files
3. View with filter functions
4. Log data
5. Status bar

7.9.2 Route Log (Interface - Rights)

Special user rights are not required to start and operate the Route Control route log interface. The interface can also be started from the Route Control Center without any special authorization.

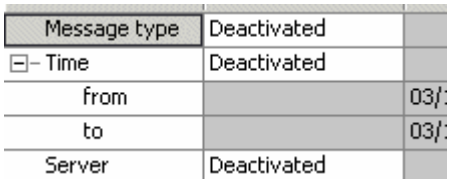
7.9.3 Route Log (Interface - Menu)

Icon	Keystroke Shortcut	Description
	F1	Calls the online Help →Help
	Ctrl + N	Creates a new log view
	Ctrl + O	Opens an existing log view
	Ctrl + S	Saves the current log view
	+ / -	Adds or removes log files from the view
	Ctrl + E	Exports data from the view to a file for editing in external media
	Ctrl + F2	Sets or deletes a bookmark (toggle)
	F2	Jumps to next bookmark
	Shift + F2	Jumps to previous bookmark
	Ctrl + Shift + F2	Deletes all bookmarks
	Ctrl + R	Resets filter and deactivates all filter settings at once. All log lines are again displayed. New filter criteria can now be set.
	F7	Activates a filter
	F5	Reload The view can be updated when the log file is modified.
	ALT + F4	Exits the application
	Ctrl + 1	Shows/hides "Log Files" window
	Ctrl + 2	Shows/hides "Filter" window
	F3 or Ctrl + F	Searches for a specific character string Up/down, with/without case matching Note: The "Time Stamp" column is not included in the character string search, as this would be very inefficient. If you are searching for a specific time of day, add a colon to the search string. e.g., ":57". Different search strings can be separated by a semicolon, e. g. batch: "ch10200; ch10201"

7.9.3.1 Route Log (Interface - List of Log Files)

You can add one or more log files to the view; these log files are initially sorted according to time. If the file has been modified on the server (in general: the source), this is indicated by yellow highlighting to the left of the file. Press F5 to update, and the file will be read in again. You can add and remove files to and from the list using the "File \ Add/Remove" menu command.

7.9.3.2 Route Log (Interface - Filter Functions)



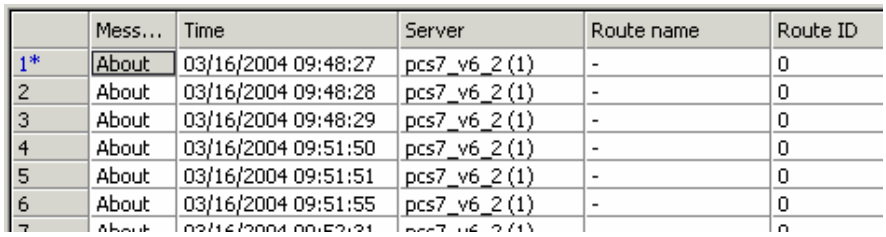
You can use the filter settings to determine how the rows are displayed in the Table area of the log data. There are three filter options:

- Deactivated: The filter is not active in this column.
- Activated: Enter a string or date to limit the data to be displayed; text portions are also permitted.
- Highlight: If a string you enter here is found in the corresponding column, the row appears highlighted in color.

Note

Different search strings can be separated by a semicolon, e. g. batch: "ch10200; ch10201"

7.9.3.3 Route Log (Interface - Table of Log Data)



You can specify which columns you wish to display in the "View \ Select Column" menu item. Note also when exporting that only visible columns are exported.

Individual rows are displayed in different colors:

- Black letters on a red background: error messages
- Black letters on a blue background: warning messages
- Black letters on a white background: routine information

7.9.3.4 Route Log (Interface - Columns)

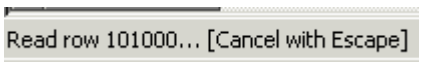
The meaning of each column in the log view is explained in the table below.

Column	Description
Message Type	Information, warning, or error, see also Route Log (Interface - Table of Log Data)
Time	Date and time of message creation. The time stamp is generated in the Route Control server.
Server	Name of computer on which the Route Control server process has created this route log.
Route Name	Name of route, i. e. instance name of RC_IF_ROUTE in CFC chart
Route ID	Resource, with which this route is working. With dynamic ID assignment, this number can change during operation.
Status	Current status of route: Start, Pause, Active, Held, etc.
Function ID	When several routes are performing overlapping material transports, they use the same ID; normally, each route uses a separate function ID.
Mode table	Group containing all modes of a route, e. g. "Production" or "Cleaning"
Mode	Modes (user program setpoint) for the route, see Note 1)
QMODE_AC	Modes (actual value of the route), see Note 1)
Source	Source of material transport
Destination	Destination of material transport
Material	Material being transported, see MATERIAL input on RC_IF_ROUTE.
Batch name	Name of batch that activates this route. Only displayed if the BATCHNAME input parameter has been interconnected on RC_IF_ROUTE, i.e., if a batch system is being used.
Batch ID	See batch name
Operating mode	When an event is triggered by the automation system, "Automatic" or "Manual" is displayed here. When an operation is performed by the user via the RC Center, the "computer name \ user" is displayed.
Event	Additional plain-text information

Note 1: These values are only displayed as binary numbers and are used for diagnostics for project engineering and plant maintenance. You must refer to the project engineering to obtain the mode names.

Activation and deactivation of a mode is displayed along with the name separately in the Event column, and can thus be more easily read by the user.

7.9.3.5 Route Log (Interface - Status Bar)



The current row number is displayed in the area on the left when a new log file is read in. The current row number and total number of rows currently open in the application are displayed in the area on the right.

A Dialogs / Interfaces

A.1 Dialogs

This section describes the dialogs in SIMATIC Route Control.

Area within a site	Mode	Dialogs
Project Engineering		
Preparation	Engineering tool	Guide: Introduction
	User authorizations	Introduction to Authorization Management
	Conversion tool	Converting of a Route Control Project
S7 project	RC wizard	Route Control Wizard: Selecting Actions
	Selection of message server	Route Control Wizard: Selecting WinCC Message Server
	Network	Route Control Wizard: Network Constellations
	AS-AS and AS-server connections	Route Control Wizard: AS-OS Connection (MAC Address) Route Control Wizard: AS-OS Connection (TCP/IP Address)
	Export objects	Route Control Wizard: Selecting Objects To Be Exported
	Summary	Route Control Wizard: Summary
	ID correction	Route Control Wizard: Adapting IDs
	Result	Route Control Wizard: Result
Eng.Tool	Import	Route Control Wizard: Import
	Process cell	Project Engineering of a Process Cell
	Portion of a plant	Project Engineering of a Unit
	Locations	Project Engineering of Plant-Related Locations
	Unit location type	Unit Location Type (Properties)
	General locations	Project Engineering of Plant-Neutral Locations
	Material, material group	Project Engineering of Materials and Material Groups
	Material sequences	Project Engineering of Material Sequences
	CSV interface	Guide: CSV Interface
		Interfaces: CSV File (Overview)
	Control element	Control Element (Properties)
		Control Element (Activation)
		Control Element (Cross-Reference List)
		Route Control Element (Properties)

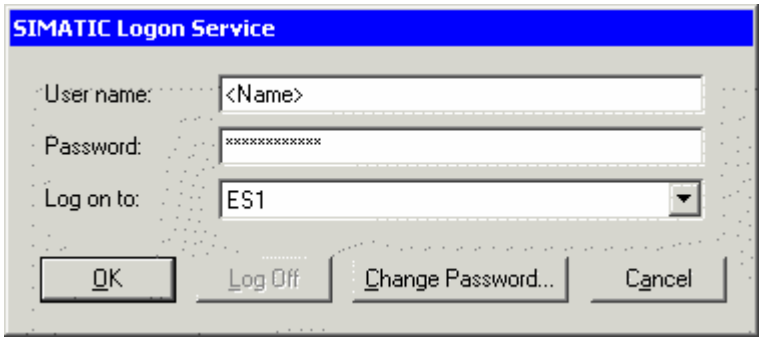
Area within a site	**Mode**	**Dialogs**
	Sensor element	Sensor Element (Properties)
		Sensor Element (Activation)
		Route Sensor Element (Properties)
	Parameter element	Parameter Element (Properties)
		Parameter Element (Activation)
		Route Parameter Element (Properties)
	Linking element	Connections (Properties)
		Route Linking Element (Properties)
	Automation system	Automation System (Properties)
	Function ID	Mode Table (Properties)
	Runtime parameters	Runtime Parameters (Properties)
	Mode table	Mode Table (Properties)
	Partial route	Partial Route (Properties)
	Project Settings	Project Settings (Properties)
	Route	Route (properties)
	Connections	Connections (Properties)
	Server	Server (Properties)
	Load the project onto the server	Loading the Route Control Server
WinCC picture	Block icon	RC Block Icon for a Route
	Interconnection	Route Control: WinCC Wizard (Instance Selection)
Runtime		
Client	Block icon	RC Block Icon for a Route
		RC Block Icon (Display Elements)
	Faceplate	RC Faceplate (Display and Operator Control Elements) - 1/4
		RC Faceplate (Display and Operator Control Elements) - 2/4
		RC Faceplate (Display and Operator Control Elements) - 3/4
		RC Faceplate (Display and Operator Control Elements) - 4/4

Area within a site	**Mode**	**Dialogs**
Route Control Center	Logon	Route Control Center: Logon
	Center	Route Control Center: General Operator Control Elements
	Server selection	Route Control Center: Selecting a Route Control Server
	Add a server	Route Control Center: Adding a Server
	Find a server	Route Control Center: Finding a Server
	Server status	Route Control Center: Server Status
	Settings	Route Control Center: Options / Settings
	Route properties	Route Control Center: Route Properties
	Locations	Route Control Center: Locations
	Error display	Route Control Center: Error during Route Request
	Sort the display	Route Control Center: Sorting
	Activation keys	Route Control Center: Activation Keys
	Update project	Route Control Center: Server Status / Update
Server	Status	Startup Sequence
	User interface	RC Server: User Interface Dialog
	AS list	RC Server: Expanded Diagnostics (AS List)
	Route list	RC Server: Expanded Diagnostics (Route List)
	AS-OS connections	RC Server: Expanded Diagnostics (OS-AS Connections)
	Clients / RCC	RC Server: Expanded Diagnostics (Clients/RCC)

A.2 Route Control Configuration interface

A.2.1 Logon Dialog

Dialog



Description

This dialog can be used to log on and log off as well as change the password. It is based on the SIMATIC Logon component, which accesses the user groups, users, and rights management of Windows.

Meaning of Operator Control Elements

Operator Control Element	Meaning
User name	Enter the Windows user name of a user who has the proper authorizations required to continue operation
Password	For security reasons, the password will not be visible
Log on to	Computer or domain to which you are logging on
OK	Once the data are entered, click "OK" to confirm and a check will be made to determine whether you have authorization. If so, the dialog box closes and you are logged on. This full user name appears in the status bar of the application. If access authorization is not granted, a notice is displayed and you can correct the data.
Log off	A user who is already logged on can log off here.
Change password	Another dialog box is displayed where you can enter the old and new password.
Cancel	Cancel the logon or logoff operation without making any changes. The former status will be retained.

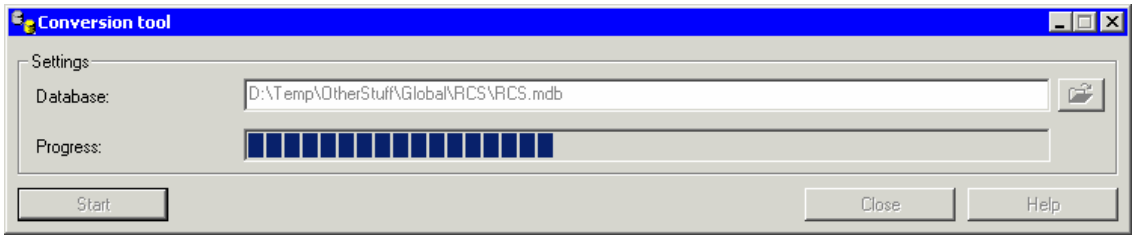
A.2.2 Converting a Route Control Project

A conversion tool is supplied for updating an RC project created in a previous version to RC V6. This tool is started automatically by the RC engineering tool if it detects that the database to be opened does not exhibit the current structure.

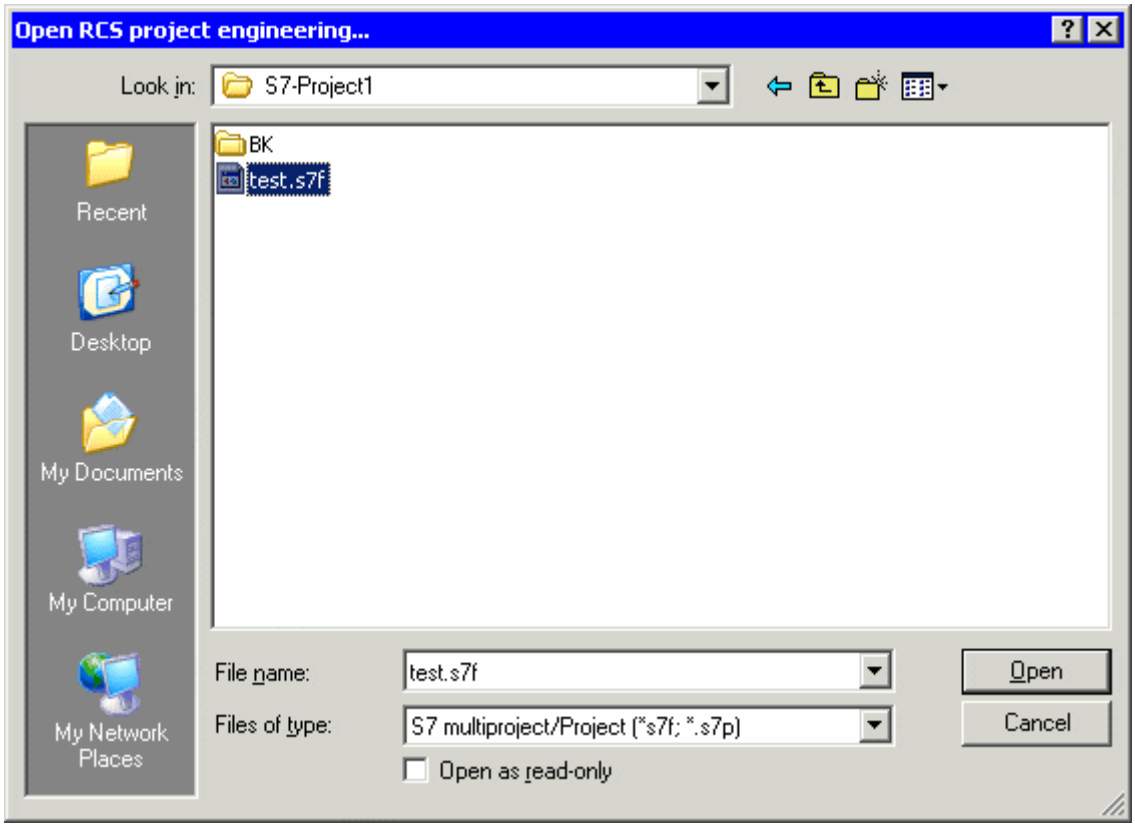
When this occurs, an information dialog first is displayed in the RC engineering tool

If you click Yes to confirm, the conversion tool is called. If you click No, the operation is canceled, and you will not be able to open and edit your RC project engineering with Version 6 of the RC engineering tool.

The conversion tool is displayed with the following dialog:



The database to be converted is already preselected. Normally, you never have to select the database. If you do have to select the database, however, this dialog is displayed, and you can select an MDB file.



Click START to begin the conversion. For backup purposes, the old database will be stored in the same path with a SIC extension. If problems occur subsequently with the new version, you can restore the original project engineering by manually renaming the backed-up file.

A progress bar provides information on the progress of the conversion. Once the conversion has been successfully completed, you can close the tool using the Close button. If you require further help, you can access the online Help for this dialog using the Help button.

Once the conversion tool is closed, the RC engineering tool makes another attempt to open the database file. The database file can be opened following a successful conversion. You can then plan your project as usual.

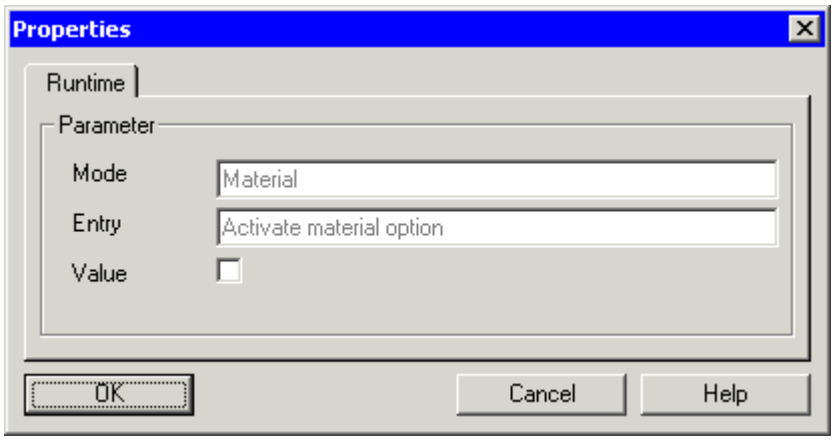
A.2.3 Route Control Project Engineering Interface

Note

While subtypes exist for the control and sensor elements in the structured view (left) in the engineering tool, there are no commands for the VOLUME and TIMER subtypes for parameter elements. For this reason, additional levels cannot be displayed in this case. VOLUME and TIMER are thus displayed only in the list view on the right.

A.2.4 Runtime Parameters (Properties)

Dialog



Description

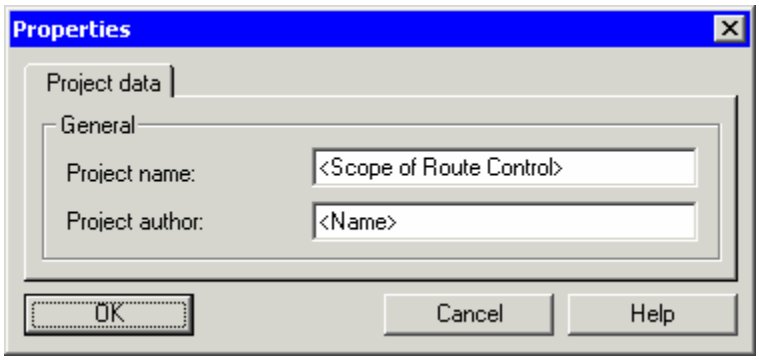
This dialog represents an example for entering and changing parameter values for a project; see also Global Settings. Refer to the description of global settings for the valid range of values and their meaning.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Mode	Name of group
Entry	Name of property (switch)
Value	Option switch, if only Yes/No is possible; otherwise, an input field for an integer value

A.2.5 Project Settings (Properties)

Dialog



Description

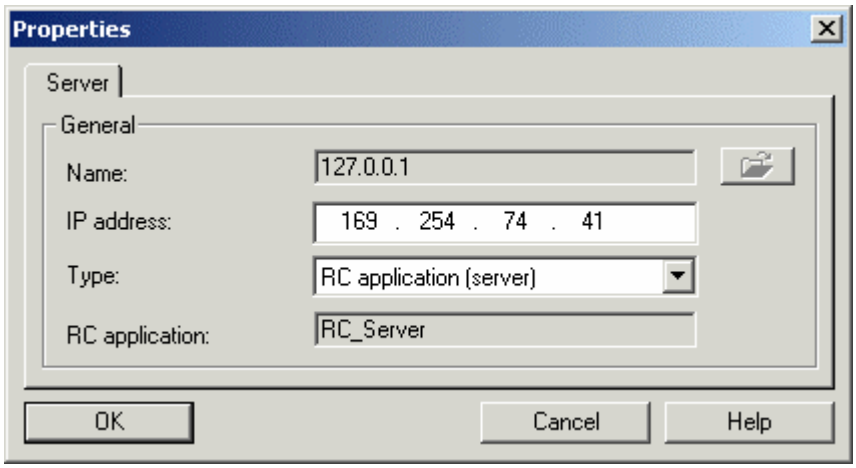
This dialog is used to change the global project settings. These settings apply to the entire Route Control project.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Project name	Suggestion: Enter the name of the area encompassed in this Route Control project. In the Route Control Center, a dialog box for selection of a Route Control server is subsequently displayed in the Route Control Center. The project name will be displayed in this dialog box. See also Route Control Center: Selecting a Route Control Server
Project Author	Name of engineer who performed the project engineering

A.2.6 Server (Properties)

Dialog



Description

This dialog shows the properties of a Route Control server computer. In addition to the name and IP address of the network card over which both Route Control computers communicate with one another, the server type is also indicated (RC application (master) or (standby)).

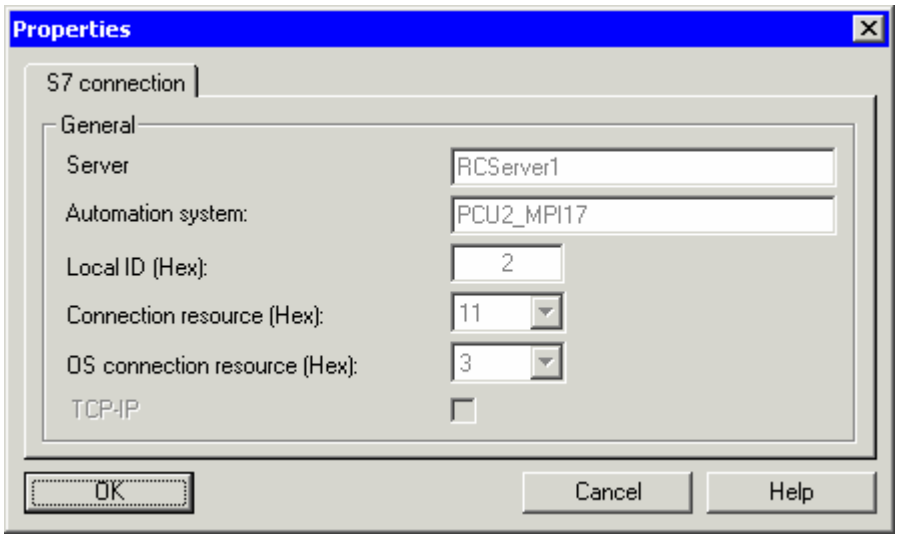
The properties can no longer be changed here. Instead, the properties must be specified in the Route Control Wizard. see Route Control Wizard: Network Constellations.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Name	Name of Route Control server as specified in the S7 project with the export wizard.
IP address	IP address of this Route Control server as specified in the S7 project with the export wizard.
Type	RC application = server (master or standalone) RC application (standby) = server (standby)

A.2.7 Connections (Properties)

Dialog



Description

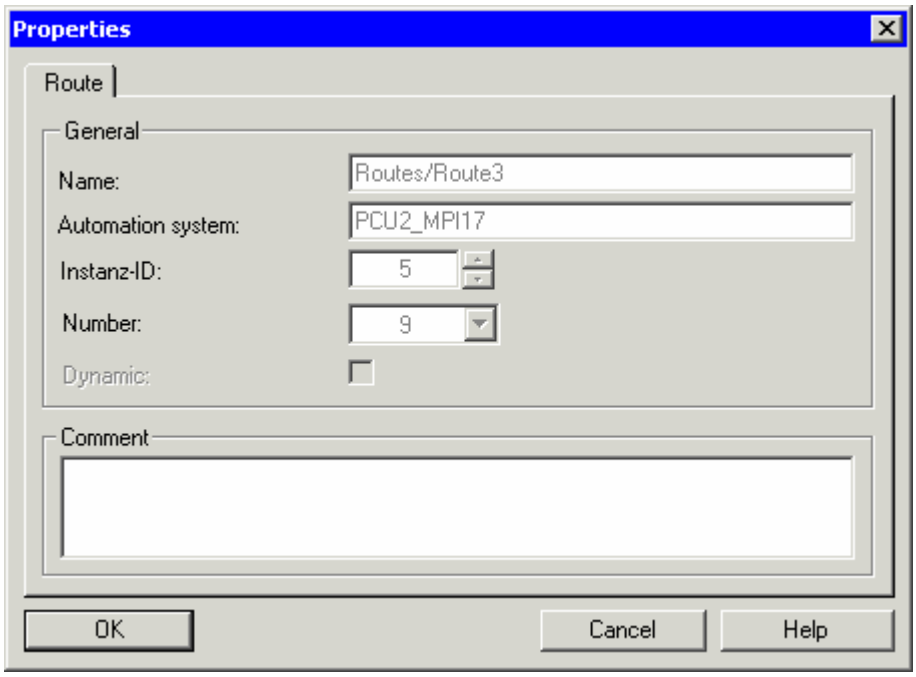
This dialog is only used to display the properties of S7 connections. For reasons of consistency, the properties cannot be changed (except for comments), as they were imported from the S7 project. The properties have already been assigned in the appropriate block in the CFC. See also NetPro settings.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Server	Name of computer acting as the Route control server
Automation system	Name of automation system to which this connection will be established
Local ID	Local ID of connections in the Route Control server
Connection resource	Connection resource on the side of the automation system
OS connection resource	Connection resource that uses the Route Control server to establish the connection
TCP/IP	Indicates whether or not the Route Control server connection will be established to the automation systems by means of a TCP/IP connection (if not, the MAC address will be used)

A.2.8 Route (Properties)

Dialog



Description

This dialog is used to display the properties of a route. For reasons of consistency, the properties cannot be changed (except for comments), as they were imported from the S7 project. The properties have already been assigned in the appropriate block in the CFC.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Name	Name of the route block in the CFC See RC_IF_ROUTE (FB800)
Automation system	Name of automation system in which this route block was configured
Number	Route number (unique from all others in the Route Control project engineering)
Dynamic	Yes: This route number will be dynamically assigned No: This route number is permanently assigned to this route
Comments	User text

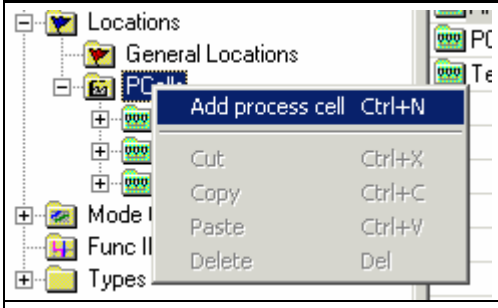
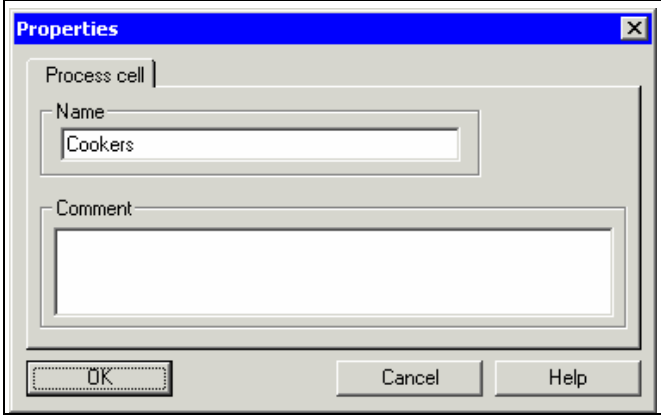
A.3 Technological Hierarchy (Process Cell)

A.3.1 Project Engineering of a Process Cell

Note

If the plant hierarchy already exists in the S7 project (process cell, unit), it can be transferred to the Route Control engineering project using the Route Control Wizard. See Route Control Wizard: Selecting Objects To Be Exported. If you want to add other process cells or units (for example, to improve the location structure), you can create process cells and units manually in the Route Control engineering tool.

Procedure

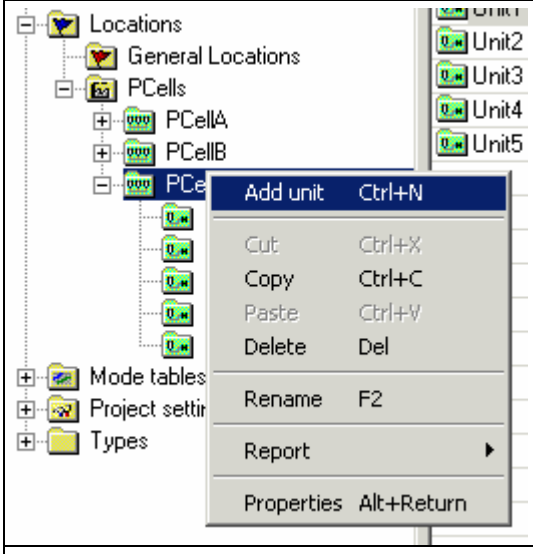
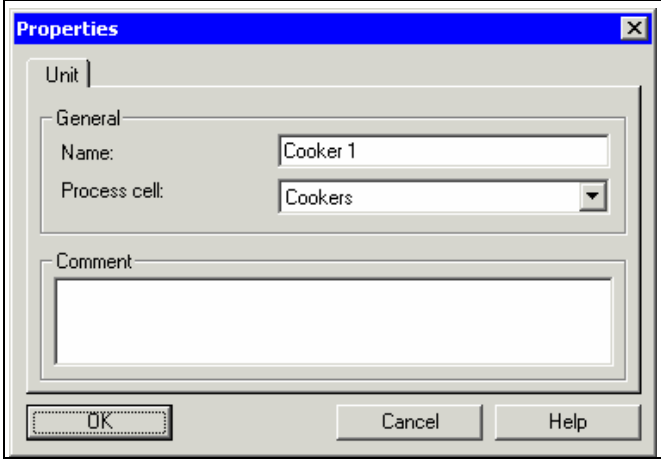
Step	Description
	- Select the "Process cells" folder - Right-click to open the shortcut menu - Select "Add process cell"
	- Enter the name of the process cell and a comment, if applicable

A.3.2 Project Engineering of a Unit

Note

If the plant hierarchy already exists in the S7 project (process cell, unit), it can be transferred to the Route Control engineering project using the Route Control Wizard. See Route Control Wizard: Selecting Objects To Be Exported. If you want to add other process cells or units (for example, to improve the location structure), you can create process cells and units manually in the Route Control engineering tool.

Procedure

Step	Description
	- Select a process cell - Right-click to open the context menu - Select "Add unit"
	- Enter the name of the unit and a comment, if applicable - You can also assign the unit to another process cell

A.4 Locations

A.4.1 Project Engineering of Plant-Neutral Locations

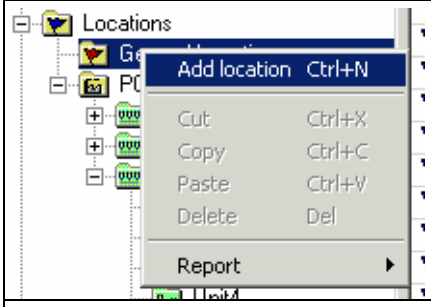
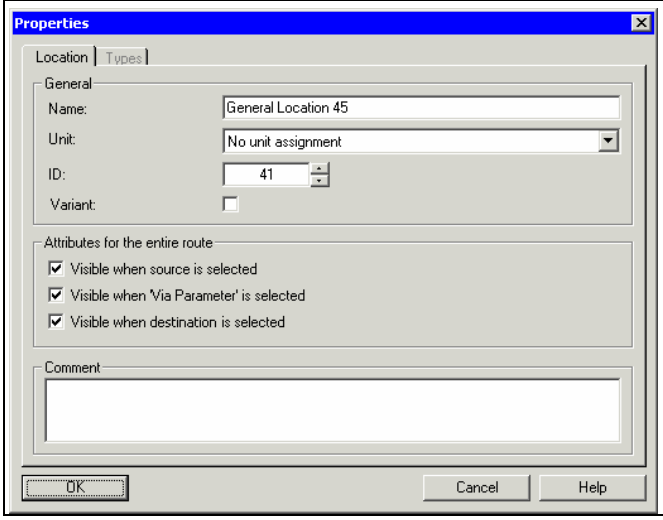
Note

A plant hierarchy does not have to be available for project engineering for plant-neutral locations.

Application Examples

Examples include locations not directly assigned to a unit, such as storm drains and water intake and discharge points, and all transition points ("via" locations) to be used as a mandatory intermediate point on a route.

Procedure

Step	Description
	- Select a unit - Right-click to open the shortcut menu - Select "Add location"
	- Enter the name of the location and a comment, if applicable - For general locations, an assignment to another process cell/unit is not possible! - If necessary, change the ID of the location - The "Attributes for the entire route" selection refers to a subsequent selection in the Route Control Center. "Visible for..." means that this location can be selected as the source, via, or destination location.

A.4.2 Project Engineering of Plant-Related Locations

Note

If the plant hierarchy already exists in the S7 project (process cell, unit), it can be transferred to the Route Control engineering project using the Route Control Wizard. See Route Control Wizard: Selecting Objects To Be Exported. If you want to add other process cells or units (for example, to improve the location structure), you can create process cells and units manually in the Route Control engineering tool.

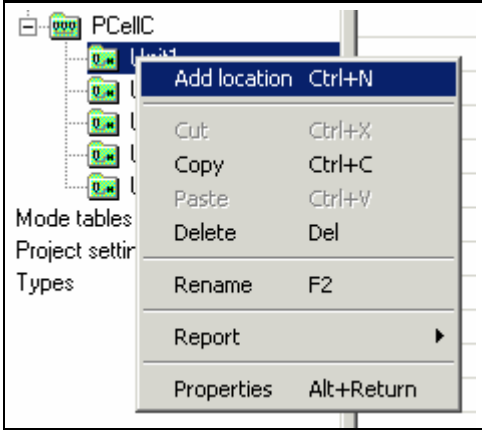
In all cases, the process cells and units should be available before you begin project engineering for locations.

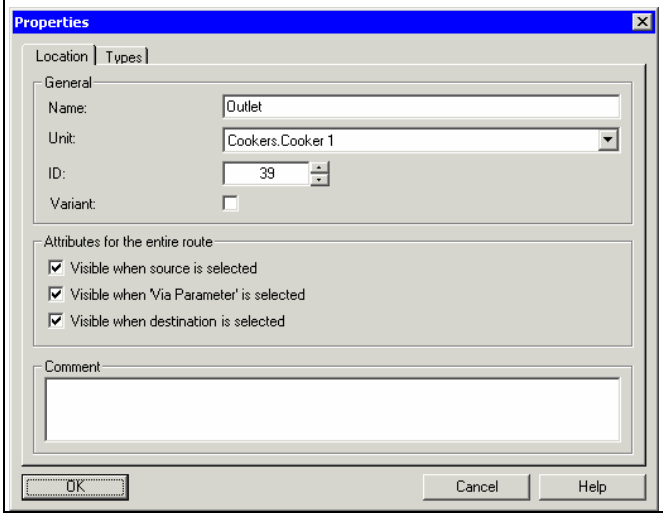
Application Examples

Discharge or intake valves on tanks

Start or end of a conveyor belt

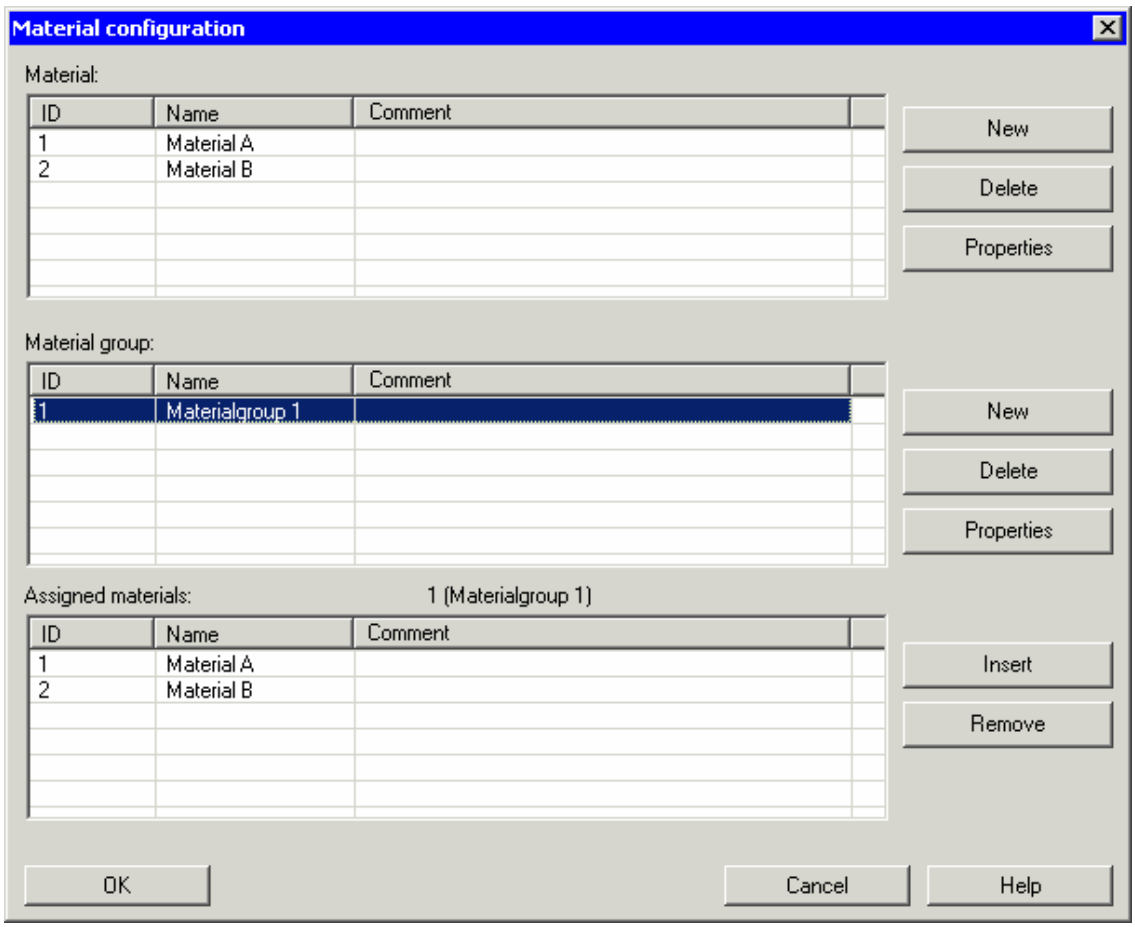
Procedure

Step	Description
	- Select a unit - Right-click to open the shortcut menu - Select "Add location"

Step	Description
	- Enter the name of the location and a comment, if applicable - If necessary, reassign the location to a different process cell/unit - If necessary, change the ID of the location - The "Attributes for the entire route" selection refers to a subsequent selection in the Route Control Center. "Visible for..." means that this location can be selected as the source, via, or destination location.

A.5 Material

A.5.1 Project Engineering of Materials and Material Groups

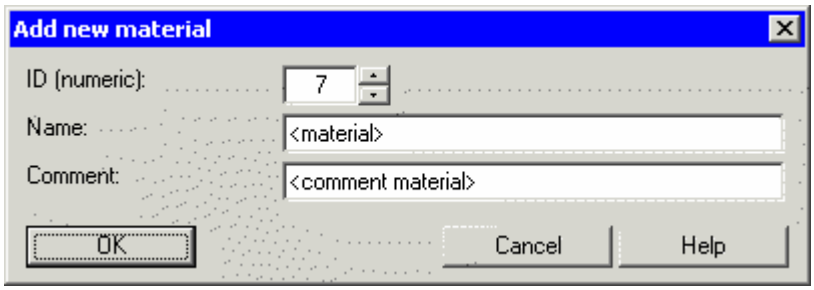


Description

1. List of materials
2. List of material groups
3. List of materials assigned to the material group selected above.

A.5.2 Adding, Changing, and Deleting a Material

Dialog



Adding a New Material

Click "New" to open another dialog and enter a new material and a comment. A unique material ID will be assigned; you can change this ID, but it must be unique.

Changing the Properties of a Material

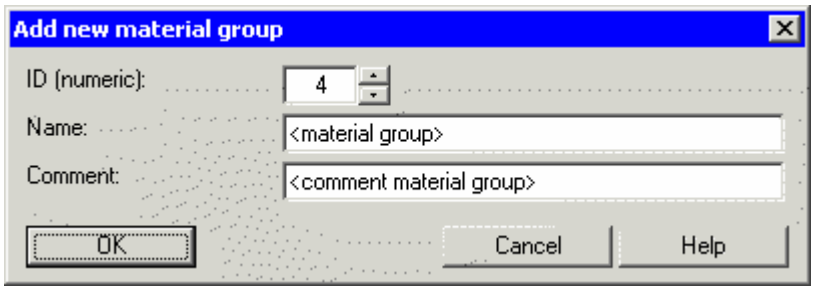
Click "Properties" to open a dialog where you can change the material name and the comment; the ID cannot be changed.

Deleting a Material

Select a material in the list and click "Delete." Following a safety prompt, the material is deleted.

A.5.3 Adding, Changing, and Deleting a Material Group

Dialog



Adding a New Material Group

See "Adding a New Material."

Changing the Properties of a Material Group

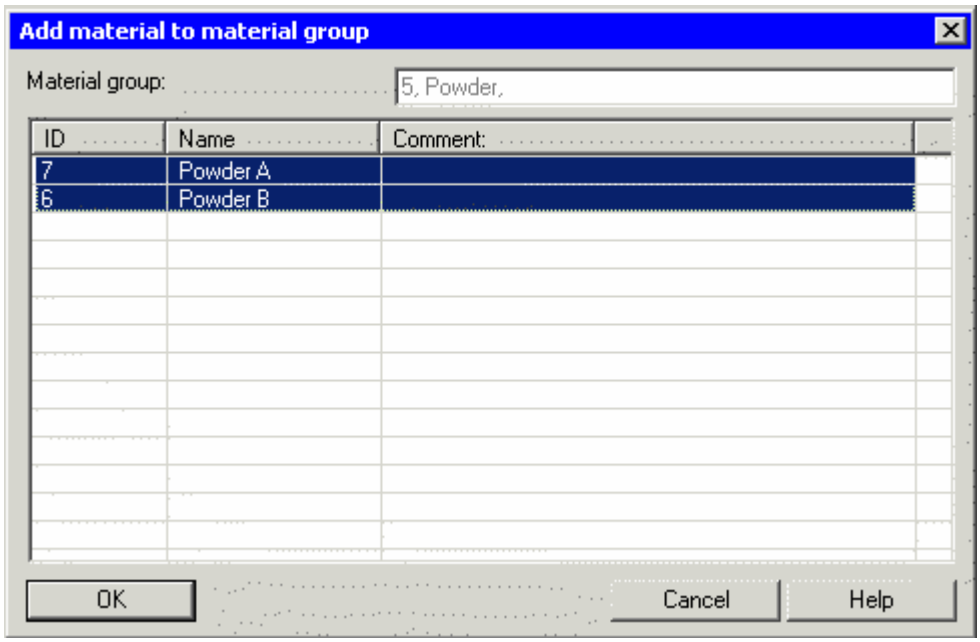
See "Changing the Properties of a Material."

Deleting a Material Group

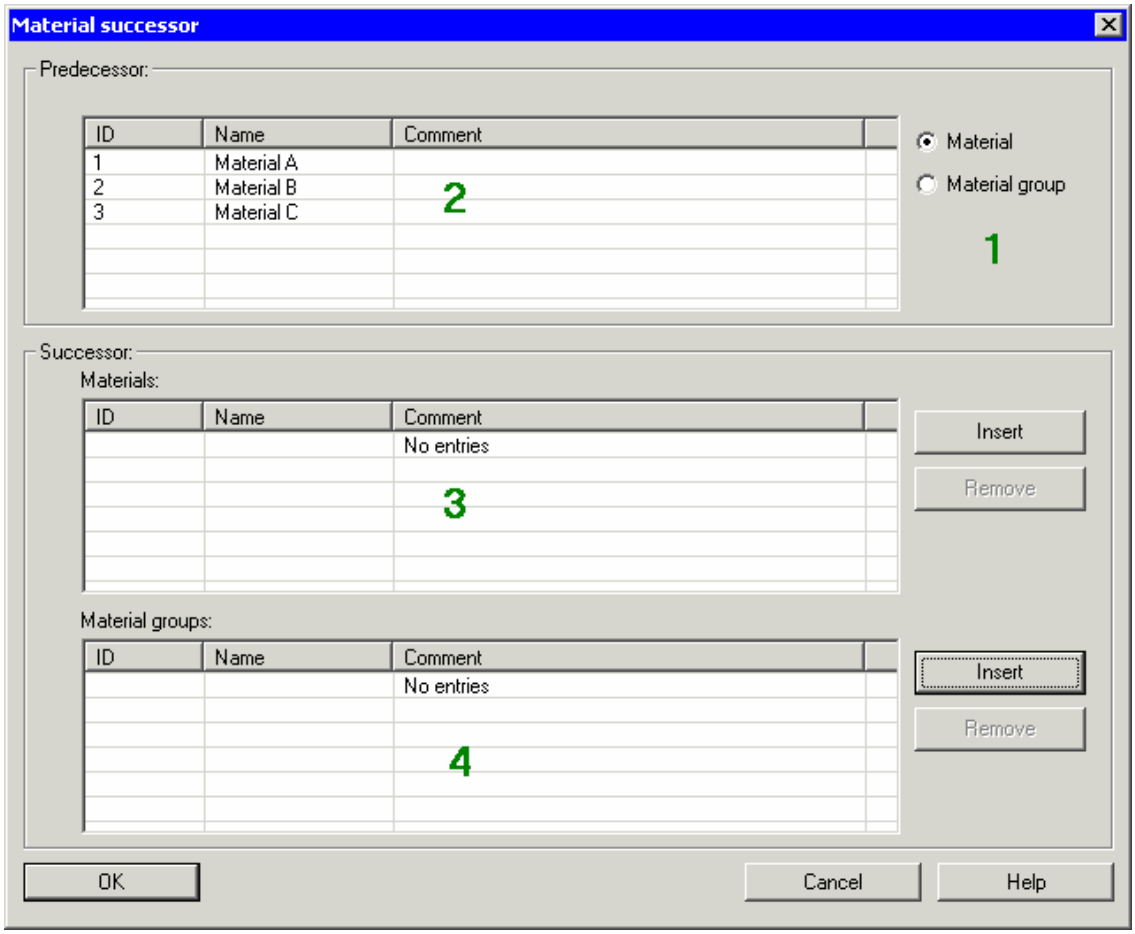
See "Deleting a Material."

A.5.4 Assigning Materials to a Material Group

Select a material group (List 2), and click "Add." A list of materials is displayed in which you can select one or more materials assign them to a material group by clicking "OK."



A.5.5 Project Engineering of Material Sequences



Description

1. Filter for displaying materials or material groups
2. List of predecessors: materials or material groups, depending on the filter
3. List of successors: materials
4. List of successors: material groups

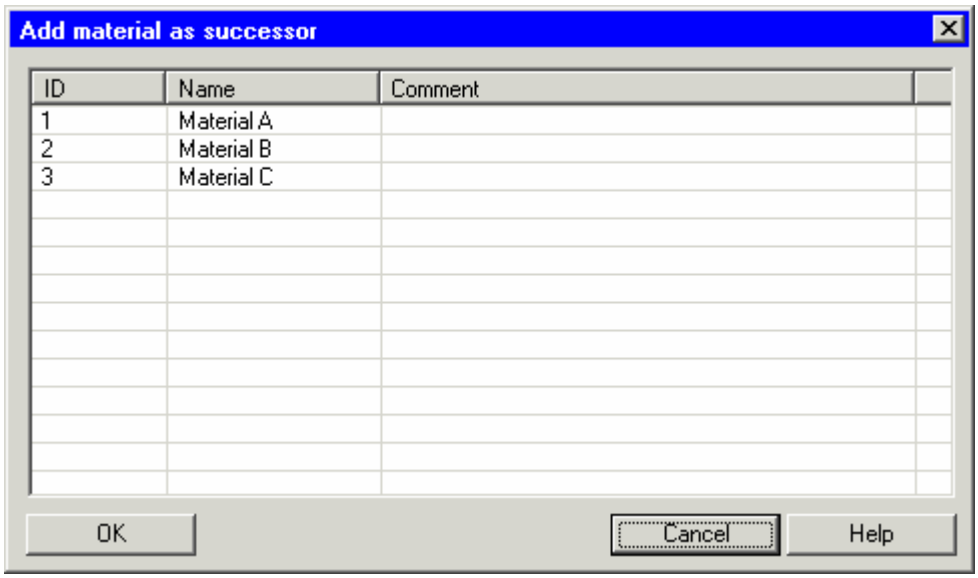
Additional Dialogs

Specifying the Successors for a Material

Specifying the Successors for a Material Group

A.5.6 Specifying Successors for a Material

Dialog



Description

1. Set the filter of the preceding materials list to "material" (List 1)
2. Select a material from the list of predecessors (List 2)
3. Click "Add" next to the list of succeeding materials *or*
4. Click "Add" next to the list of succeeding material groups
5. A list of materials or material groups is displayed; select one or more entries, and click "OK" to accept the permissible succeeding materials.

Additional Dialogs

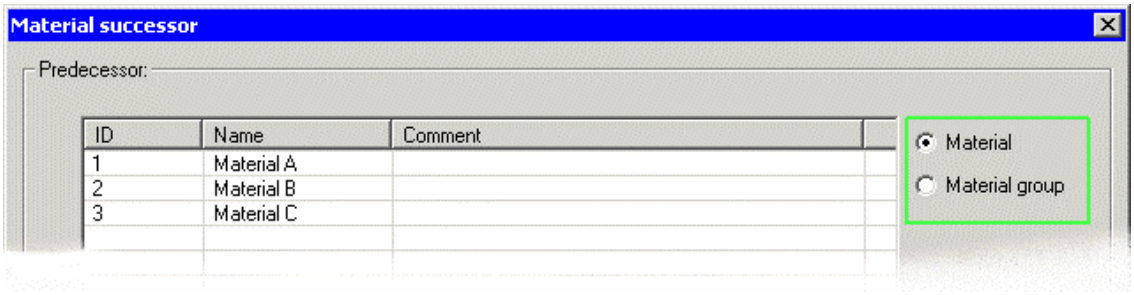
Project Engineering of Material Sequences

Specifying the Successors for a Material Group

A.5.7 Specifying Successors for a Material Group

Dialog

Select "Material group" as the filter to start (right side of main dialog)...



... then follow the same procedure as for "Specifying the Successors for a Material."

Additional Dialogs

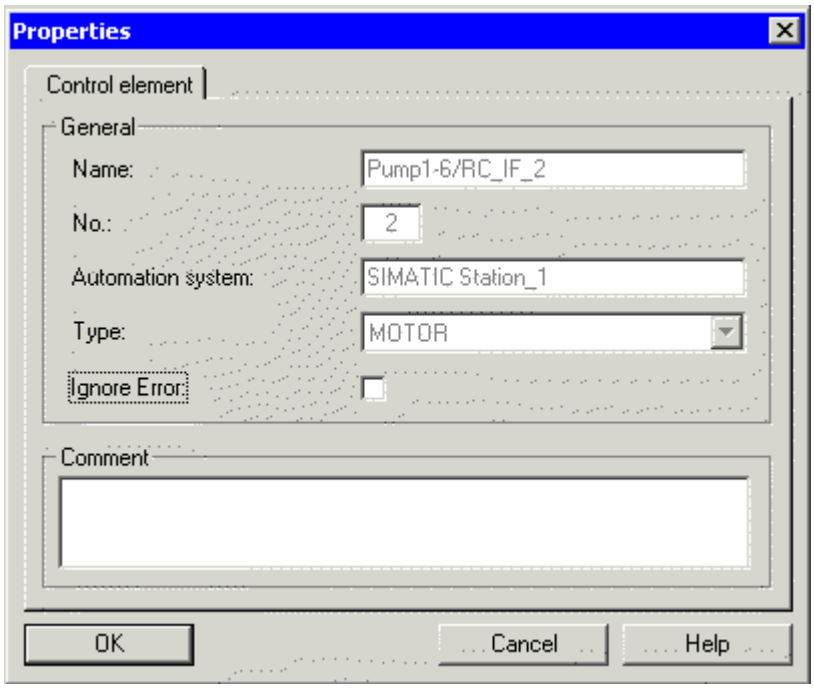
Project Engineering of Material Sequences

Specifying the Successors for a Material

A.6 Elements

A.6.1 Control Element (Properties)

Dialog



Description

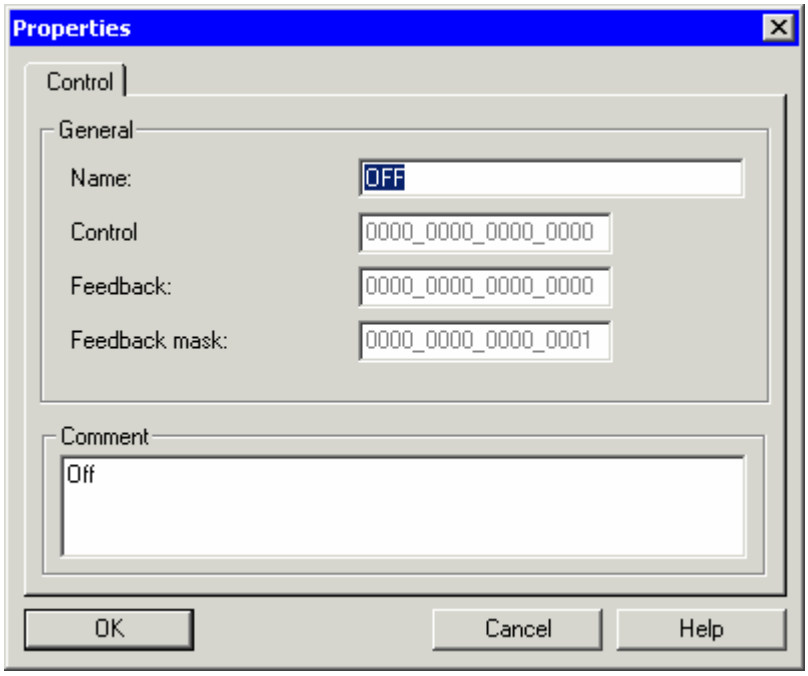
This dialog displays the properties of a control element. For reasons of consistency, the properties cannot be changed (except for comments), as they were imported from the S7 project. The properties have already been assigned in the appropriate block in the CFC.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Name	Name of control element
No.	Control element number that is unique from all others
Automation system	Name of automation system to which the control element is assigned through project engineering
Type	Type of element
Ignore error	Not selected: Feedback error of a control element does *not* result in a mode level error Selected: Feedback error of a control element results in a mode level error (= former *ignore error bit*)
Comments	User text

A.6.2 Control Element (Activation)

Dialog



Description

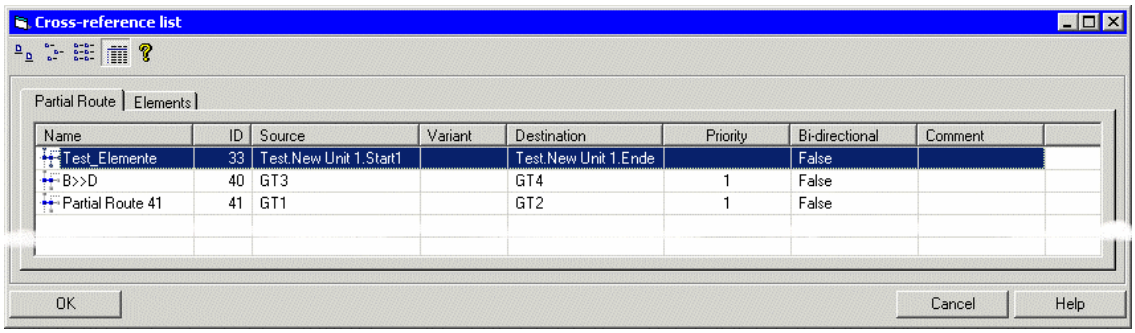
This dialog displays the properties of a control element type. The properties of the standard types cannot be changed. This dialog is used to enter new command values and names and to modify them.

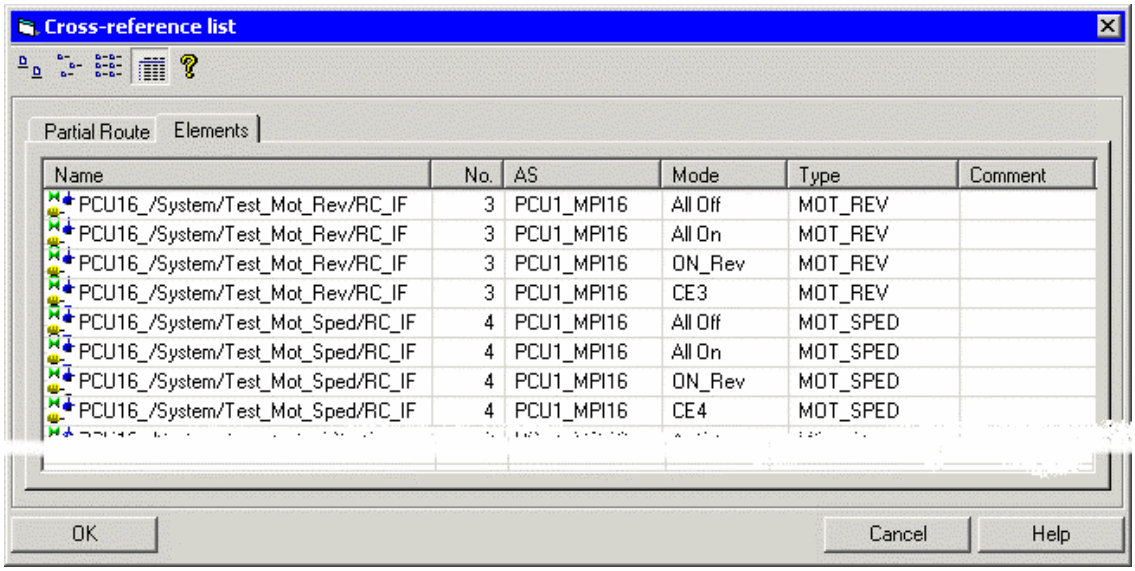
Meaning of Operator Control Elements

Operator Control Element	Meaning
Name	Name of command, for example, OPEN, CLOSED, OFF, ON, etc.
Command	16-bit value of which the 13 least significant bits can be used. This value is reduced to 13 bits before it is output in the interface block.
Feedback	16-bit value linked to the feedback mask using an AND operation, which is used to indicate the current actual value from the process.
Feedback mask	16-bit value that masks out certain bits of the feedback parameter by an AND operation.
Comments	User text

A.6.3 Control Element (Cross-Reference List)

Dialog





Description

The cross reference list, which can be opened in each interconnected on non-interconnected element using the shortcut menu, shows all of the partial routes containing the element and all of the other elements (types) of this partial route.

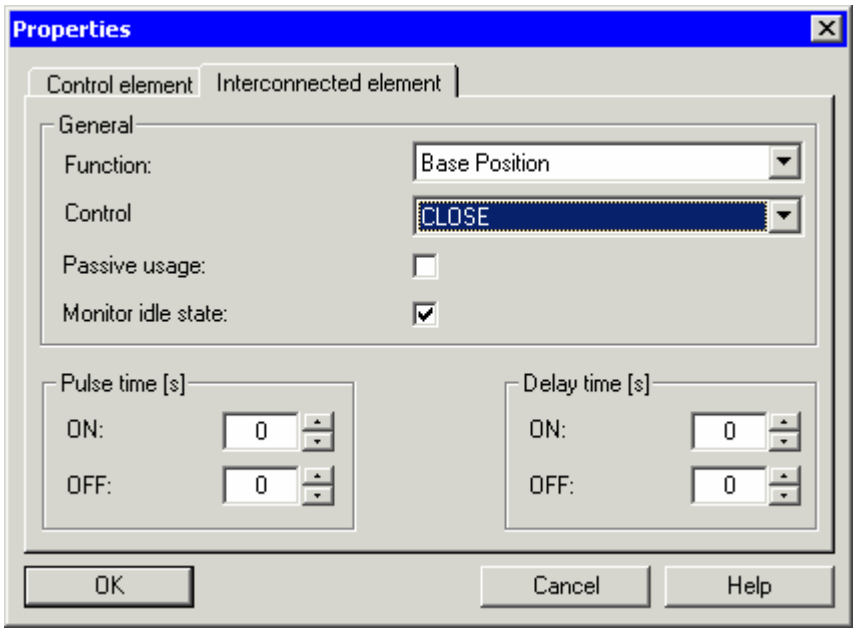
Meaning of Operator Control Elements

Operator Control Element	Meaning of Partial Route Tab
Name	Name of partial route
ID	Partial route number that is unique from all others
Source	Source location of partial route
Variant	Variant location of partial route (optional)
Destination	Destination location of partial route
Priority	Priority of partial route
Bi-directional	Usability of partial route in both directions or only one direction
Comments	User text

Operator Control Element	Meaning of Elements Tab
Name	Name of element
No.	Number of element
Automation system	Name of automation system
Mode	Mode level in which the element is inserted in this partial route
Type	Type of element
Comments	User text

A.6.4 Route Control Element (Properties)

Dialog



Description

This dialog is used to change or assign the properties of a control element inserted in a partial route. This dialog will be displayed automatically if an element from an automation system is inserted in a partial route using a drag-and-drop operation.

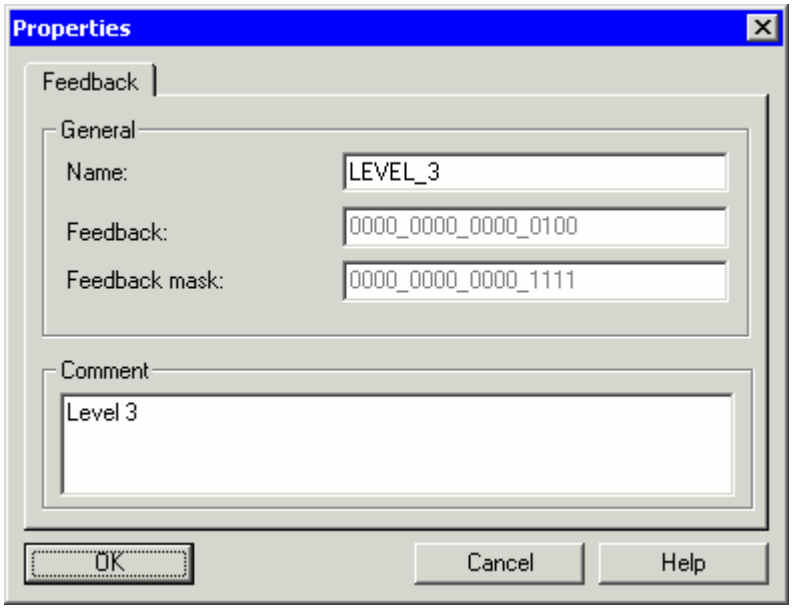
Meaning of Operator Control Elements

Operator Control Element	Meaning
Mode	Model level of partial route to which the element is assigned
Command	Activation command received by the element if the route activates this mode level during runtime.
Passive use	Yes. In this mode level, the element will only be requested for its position and not activated.
Monitor idle state	Yes: When the mode level is deactivated, the element is monitored to determine if it leaves its idle state; for example, a valve must remain closed (CLOSE)
Pulse time ON	Duration of the HIGH signal for a pulsed element (such as a valve), in seconds.
Pulse time OFF	Duration of the HIGH signal for a pulsed element (such as a valve), in seconds.
Delay time ON	Time elapsing after a mode level is activated before the element itself is activated.
Delay time OFF	Time elapsing after a mode level is deactivated before the element itself is deactivated.

A.7 Sensor Elements

A.7.1 Sensor Element (Control)

Dialog



Description

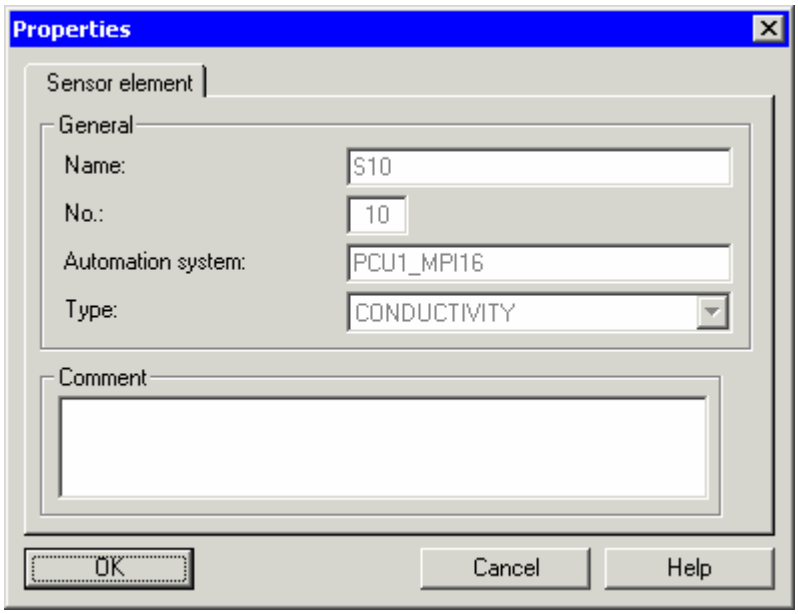
This dialog displays the properties of a sensor element type. The properties of the standard types cannot be changed.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Name	Name of feedback *Note: These properties cannot be changed for standard types*
Feedback	16-bit value linked to the feedback mask using an AND operation, which is used to indicate the current actual value from the process.
Feedback mask	16-bit value that masks out certain bits of the feedback parameter by an AND operation.
Comments	User text

A.7.2 Sensor Element (Properties)

Dialog



Description

This dialog displays the properties of a sensor element. For reasons of consistency, the properties cannot be changed (except for comments), as they were imported from the S7 project. The properties have already been assigned in the appropriate block in the CFC.

Meaning of Operator Control Elements

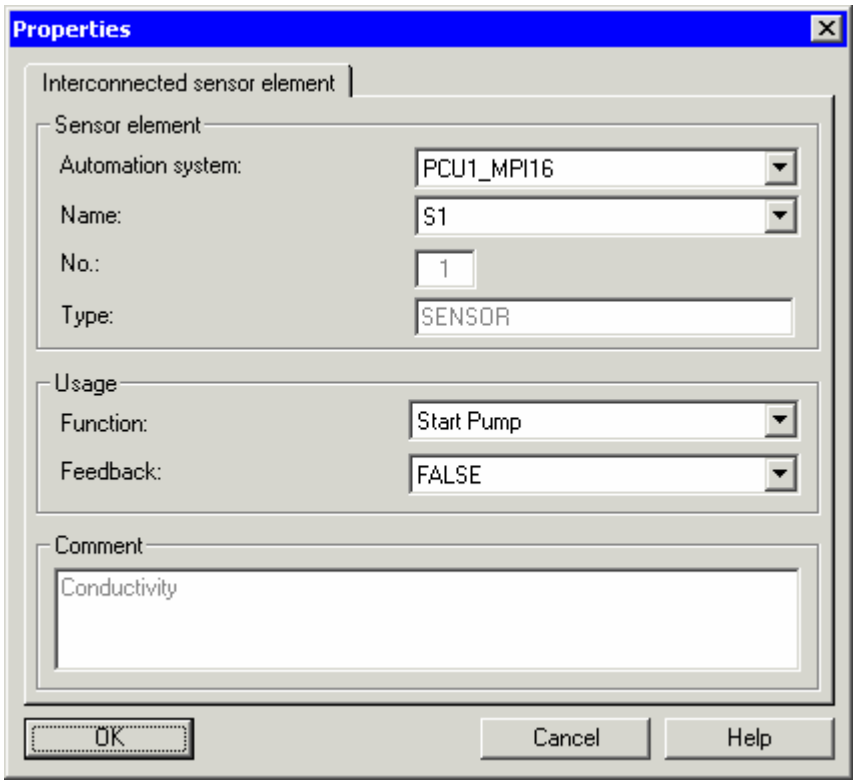
Operator Control Element	Meaning
Name	Name of sensor element
Number	Unique number of the sensor element
Automation system	Name of automation system to which the sensor element is assigned through project engineering
Type	Type of sensor element
Comments	User text

A.7.3 Sensor Element (Cross-Reference List)

See Control Element (Cross-Reference List)

A.7.4 Route Sensor Element (Properties)

Dialog



Description

This dialog is used to change or assign the properties of a sensor element inserted in a partial route. This dialog will be displayed automatically if an element from an automation system is inserted in a partial route using a drag-and-drop operation.

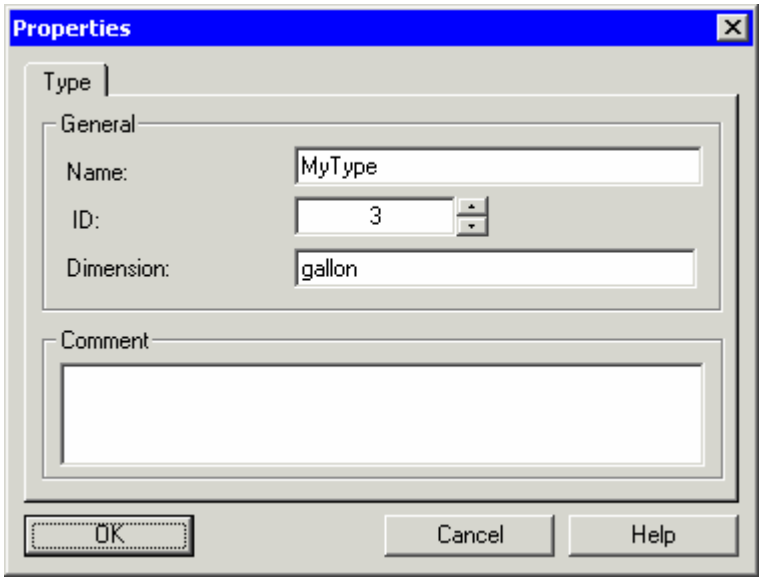
Meaning of Operator Control Elements

Operator Control Element	Meaning
Automation system	Name of the automation system to which the element is assigned during project engineering (S7 project engineering).
Name	Name of sensor element
No.	Number of the sensor element as assigned in the CFC chart (for example, by the Route Control Wizard).
Type	Type of sensor element
Mode	Mode level in which the sensor element is inserted in this partial route.
Feedback	Expected feedback causing this sensor to switch over.
Comments	User text

A.8 Parameter Elements

A.8.1 Parameter Element (Activation)

Dialog



Description

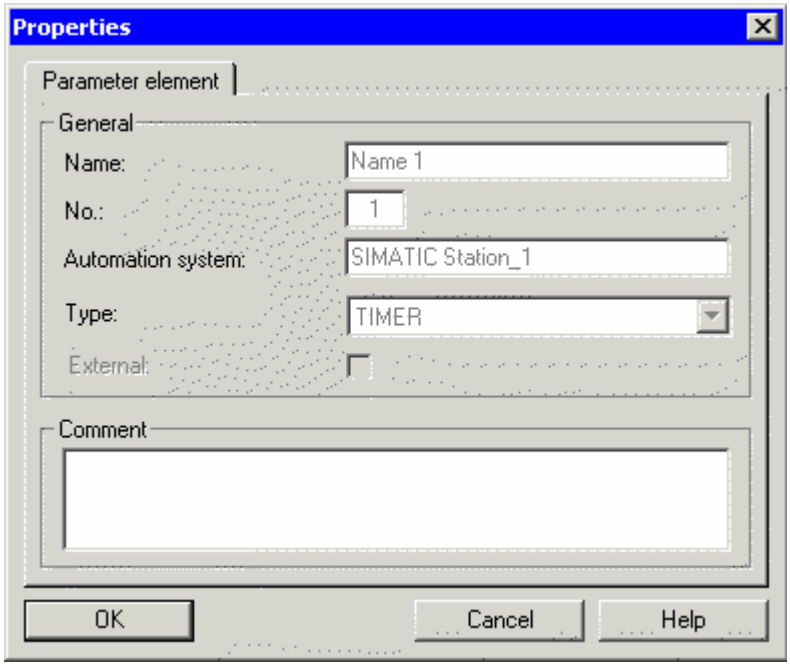
This dialog displays the properties of a parameter element type. The properties of the standard types cannot be changed.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Name	Name parameter element type
ID	Type number that is unique from all others
Dimension	Unit, such as second, liter, gallon, etc.
Comments	

A.8.2 Parameter Element (Properties)

Dialog



Description

This dialog displays the properties of a parameter element. For reasons of consistency, the properties cannot be changed (except for comments), as they were imported from the S7 project. The properties have already been assigned in the appropriate block in the CFC.

Meaning of Operator Control Elements

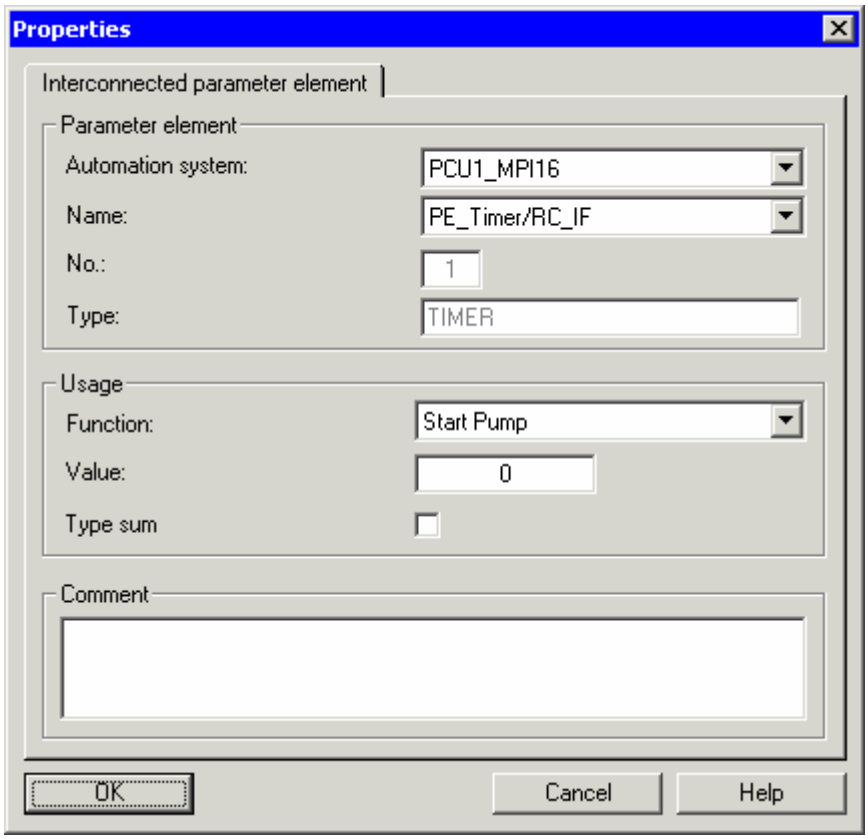
Operator Control Element	Meaning
Name	Name of parameter element
Number	Unique number of the parameter element
Automation system	Name of automation system to which the parameter element is assigned through project engineering
Type	Type of sensor element
External	Indicates whether this is an external parameter element (that is, setpoint will be transferred during runtime) Selected: External parameter element; index is assigned through project engineering. Not selected: Internal parameter element, value is assigned through project engineering.
Comments	User text

A.8.3 Parameter Element (Cross-Reference List)

See Control Element (Cross-Reference List)

A.8.4 Route Parameter Element (Properties)

Dialog



Description

This dialog is used to change or assign the properties of a parameter element inserted in a partial route. This dialog will be displayed automatically if an element from an automation system is inserted in a partial route using a drag-and-drop operation.

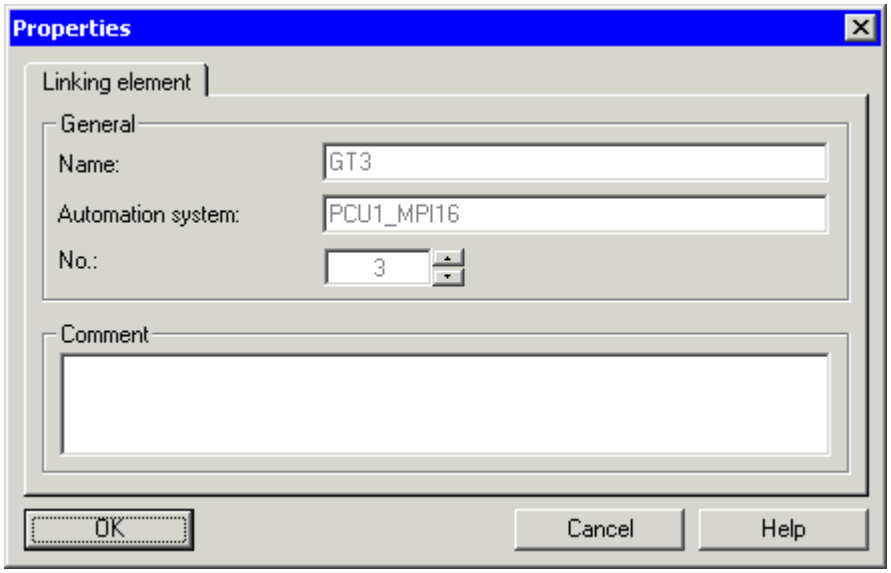
Meaning of Operator Control Elements

Operator Control Element	Meaning
Automation system	Name of the automation system to which the element is assigned during project engineering (S7 project engineering).
Name	Name of parameter element
No.	Number of the parameter element as assigned in the CFC chart (for example, by the Route Control Wizard).
Type	Type of parameter element
Mode	Mode level in which the parameter element is inserted in this partial route.
Index	In the case of external parameter elements, the index is an instruction to one of the external setpoints in RC_IF_ROUTE, see RC_IF_ROUTE (FB800) , parameters EXT_xxx_I and EXT_xxx_O
Sum type	All setpoints of all parameter elements of a route will be added during runtime and transferred to the automation systems (for example, when specifying volumes in pipelines, if the total quantity of product is used to calculate the discharge quantity and duration).
Comments	User text

A.9 Linking Elements

A.9.1 Linking Element (Properties)

Dialog



Description

This dialog displays the properties of a linking element. For reasons of consistency, the properties cannot be changed (except for comments), as they were imported from the S7 project. The properties have already been assigned in the appropriate block in the CFC.

Meaning of Operator Control Elements

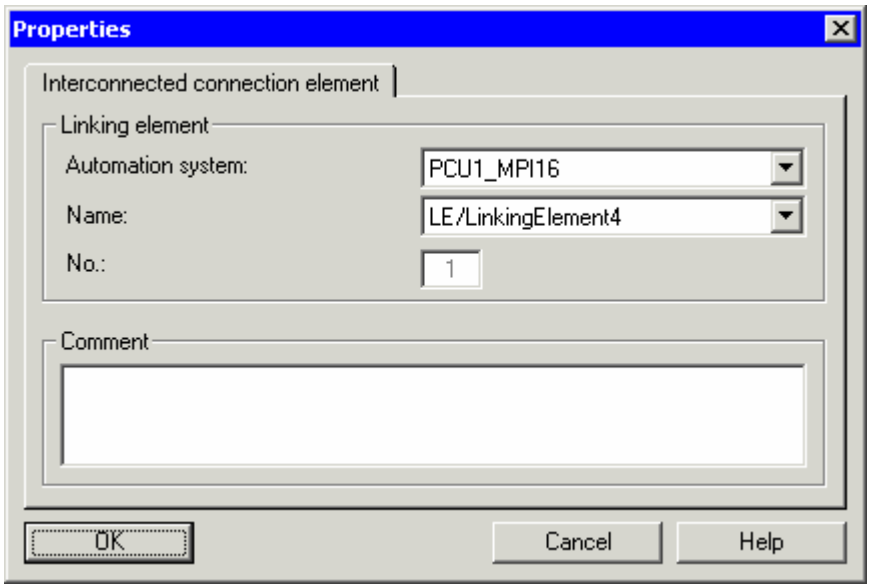
Operator Control Element	Meaning
Name	Name of linking element
Automation system	Name of automation system to which the linking element is assigned through project engineering
Number	Linking element number that is unique from all others
Comments	User text

A.9.1.1 Linking Element (Cross-Reference List)

See Control Element (Cross-Reference List)

A.9.2 Route Linking Element (Properties)

Dialog



Description

This dialog is used to change or assign the properties of a linking element inserted in a partial route. This dialog will be displayed automatically if an element from an automation system is inserted in a partial route using a drag-and-drop operation.

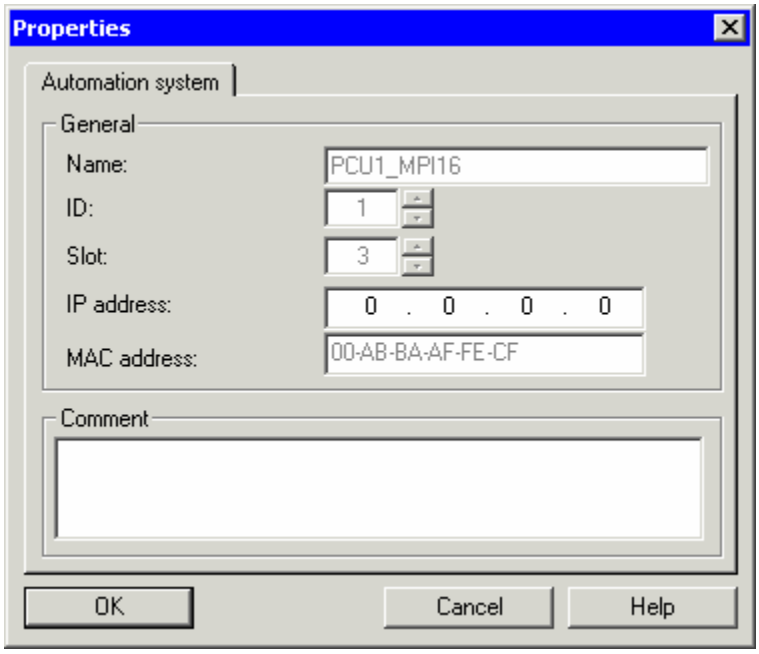
Meaning of Operator Control Elements

Operator Control Element	Meaning
Automation system	Name of the automation system to which the element is assigned during project engineering (S7 project engineering).
Name	Name of linking element
No.	Linking element number as assigned in the CFC chart (for example, by the Route Control Wizard).
Comments	User text

A.10 Automation System

A.10.1 Automation System (Properties)

Dialog



Description

This dialog displays the properties of an automation system. For reasons of consistency, the properties cannot be changed (except for comments), as they were imported from the S7 project.

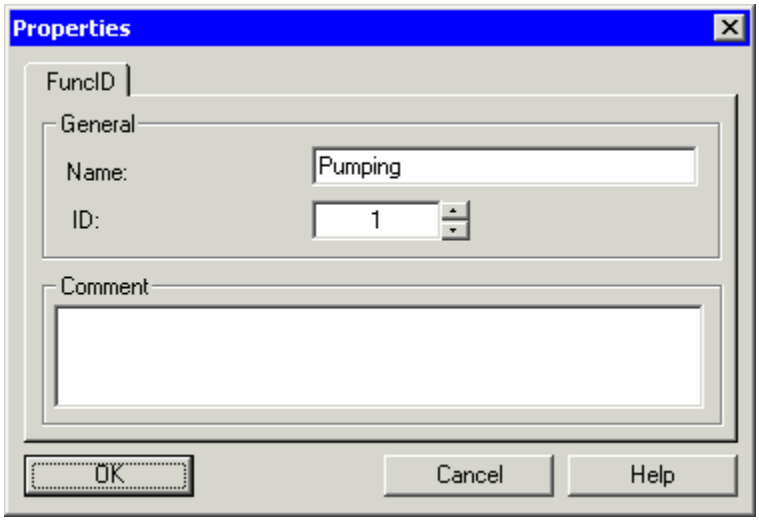
Meaning of Operator Control Elements

Operator Control Element	Meaning
Name	Name of automation system
ID	Automation system number that is unique from all others
Slot	Slot on the basic rack of the automation system (required for addressing)
IP address	IP address as specified in the Route Control export wizard (if present)
MAC address	IP address as specified in the Route Control export wizard (if present)
Comments	User text

A.11 Function ID and Level

A.11.1 Function ID (Properties)

Dialog



Description

This dialog is used for entering and changing the name and properties of a function ID. Function IDs are keys for differentiating routes. Each route operates with a different function ID, usually its own route ID.

However, if particular routes are supposed to operate together, they must use the same function ID. IDs assigned by the user should be higher than IDs assigned by the system, thus 301 or higher. This facilitates diagnostics during runtime because it can be instantly recognized whether a system function ID or a user function ID is involved.

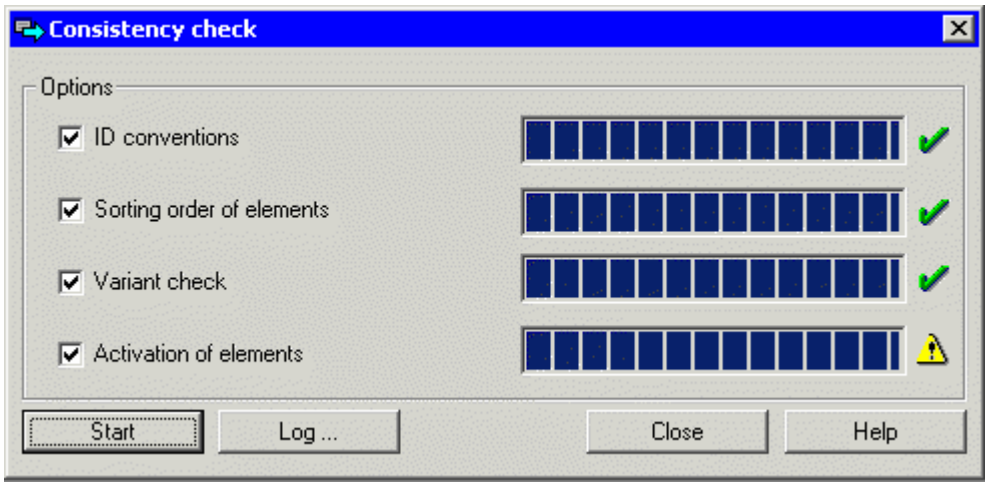
Meaning of Operator Control Elements

Operator Control Element	Meaning
Name	Name of function ID
ID	Function ID number that is unique from all others 1..300: Number assigned automatically by the system when the user assigned a value of 0 in RC_IF_ROUTE; refer to RC_IF_ROUTE (FB800) 301..32,000: Can be used by the user program

Operator Control Element	Meaning
Comments	User text

A.12 Consistency Check

Dialog



Description

This dialog can be used to perform a consistency check of the Route Control project engineering. The result for each individual step is displayed to the right of the progress bar.

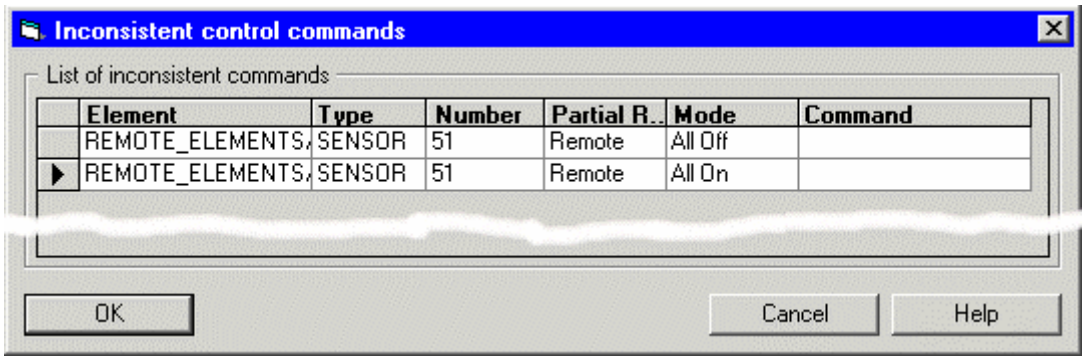
Meaning of Operator Control Elements

Operator Control Element	Meaning
ID conventions	The IDs of elements are checked for uniqueness and validity on the basis of the value range. Because the IDs are assigned by the Route Control Wizard, or a plausibility check has already been performed prior to the export, an error is never permitted to occur here.
Sorting order of elements	The sorting order of elements will be checked. This order is not relevant at present in Route Control V6.1 (liquid transports). This sort order will become relevant when solid material transports are introduced because the interlocking of elements amongst themselves depends on this.
Variant check	Locations in the project engineering designated as variants will be checked.
Activation of elements	A check is made to determine whether elements will be activated with commands that are not available for their type (for example, activation of a motor with OPEN/CLOSED instead of ON/OFF).

Operator Control Element	Meaning
Start	Start the check operation after selecting the options
Log	Once the check is concluded, you can request a log display, see also Route Control Engineering: Checking Data Consistency for a description of the log file.
Close	Dialog box will be closed
Help	Call the online Help

A.12.1 Consistency Check (Result)

Dialog



Description

This dialog shows elements and any inconsistent commands for these elements.

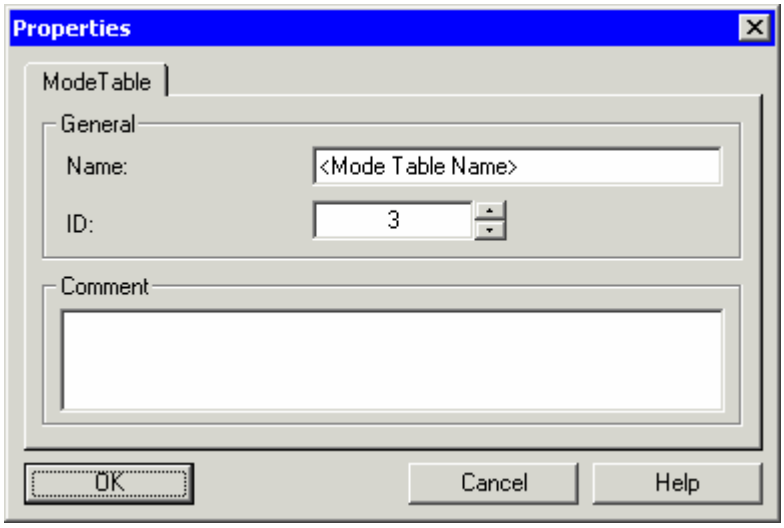
Meaning of Operator Control Elements

Column	Meaning
Element	Name of interconnected elements having inconsistent commands.
Type	Type of element, such as MOTOR, SENSOR, etc.
Number	Number (ID) of element
Partial route	Name of partial route in which this element is interconnected
Mode	Mode level in which the element is activated
Command	Activation command that is inconsistent (that is, not allowed).

A.13 Mode Catalog

A.13.1 Mode Table (Properties)

Dialog



Description

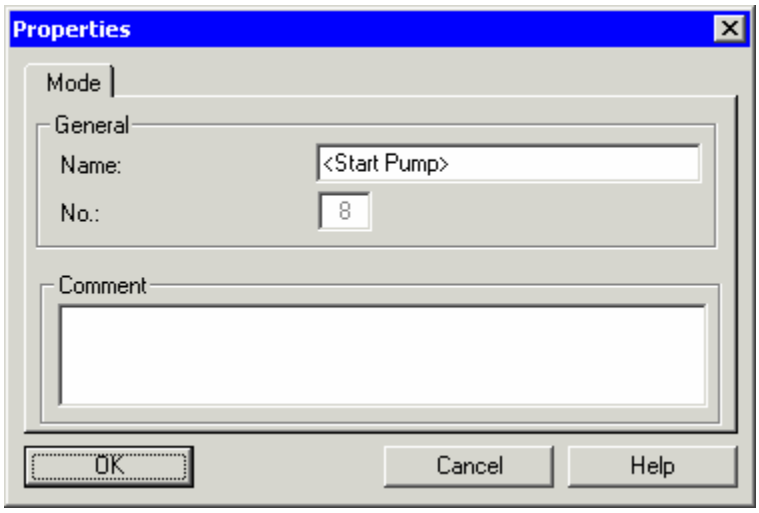
This dialog is used to input and change the properties of a mode table.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Name	Name of mode table
No.	Unique mode table number (assigned by the system)
Comments	User text

A.13.2 Mode Level (Properties)

Dialog



Description

This dialog is used to input and change the properties of a mode level.

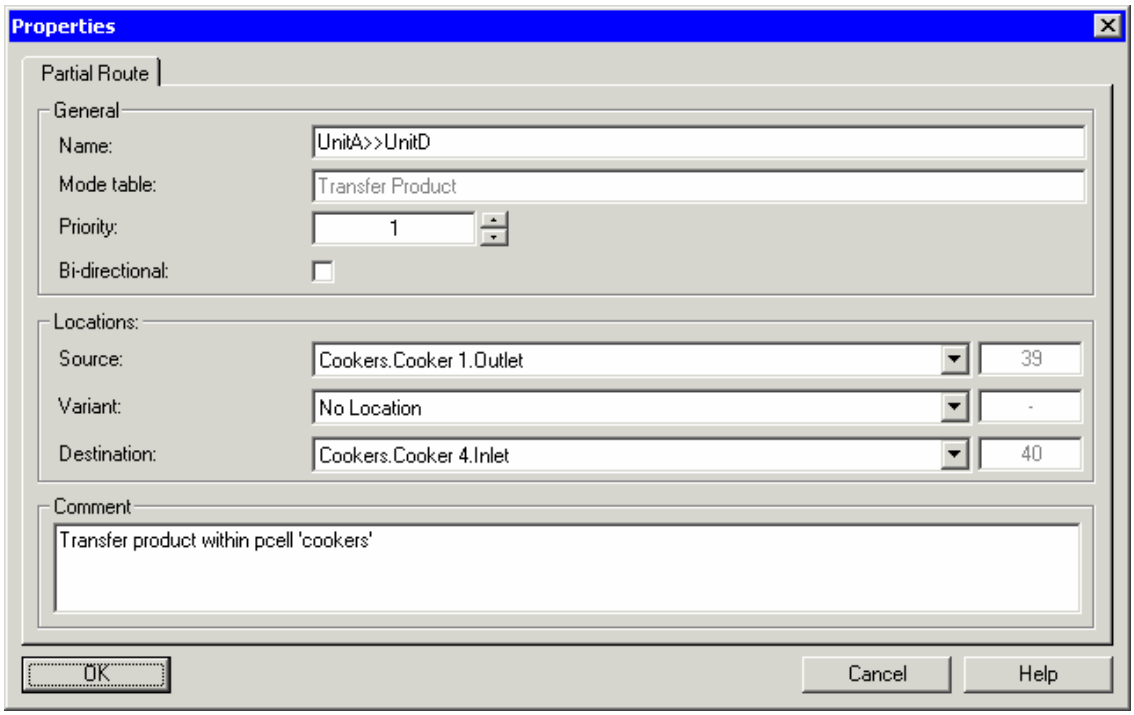
Meaning of Operator Control Elements

Operator Control Element	Meaning
Name	Name of mode level
No.	Unique mode level number (1 to 32)
Comments	User text

A.14 Partial Route

A.14.1 Partial Route (Properties)

Dialog



Description

This dialog is used to input and change the properties of a partial route.

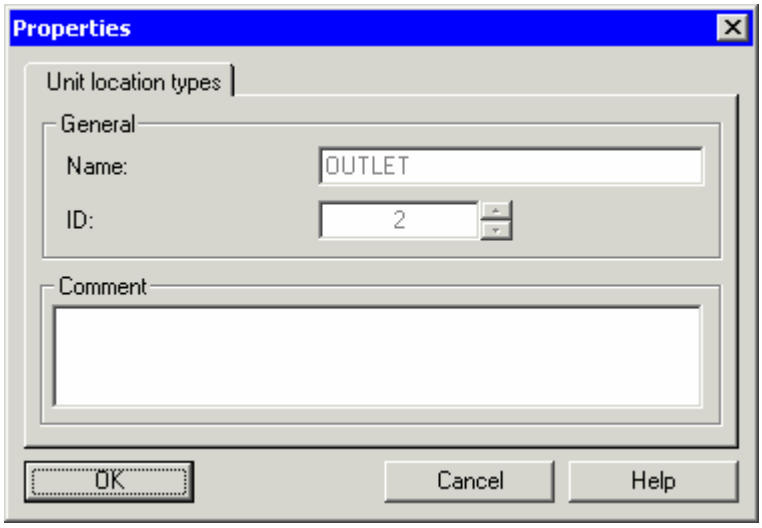
Meaning of Operator Control Elements

Operator Control Element	Meaning
Name	Name of partial route Suggestion: Use the following structure for the partial route name: <Source location><arrow><destination location>, thus, for example, "Tank A>>Location G" or "Location G>>Tank D"; this will enable you to more easily verify the partial routes later on during the route search (offline).
Mode table	Mode table in which this partial route was created. This property cannot be changed.
Priority	1: Highest priority 9999: Lowest priority When searching for routes during runtime, the partial routes with higher priority (lower priority number) are used if more than one path is possible.
Bi-directional	Yes: This partial route can be run in both directions during the route search. Attention: Be aware that bi-directional partial routes significantly increase the number of routes that can be found in a network! No: This partial route can only be run from the source (source location) to the destination (destination location) without exception. Default value is "not bidirectional" in order to exclude undesirable paths initially.
Source	Source location of this partial route. The location numbers are also be displayed for information purposes; they can not be changed here (property of the respective location)
Variant	Transition location of the partial route (optional)
Destination	Destination location of this partial route
Comments	User text

A.15 Unit Location Type

A.15.1 Unit Location Type (Properties)

Dialog



Description

This dialog shows the properties of a location for units. This function is reserved for future use and should not be configured here.

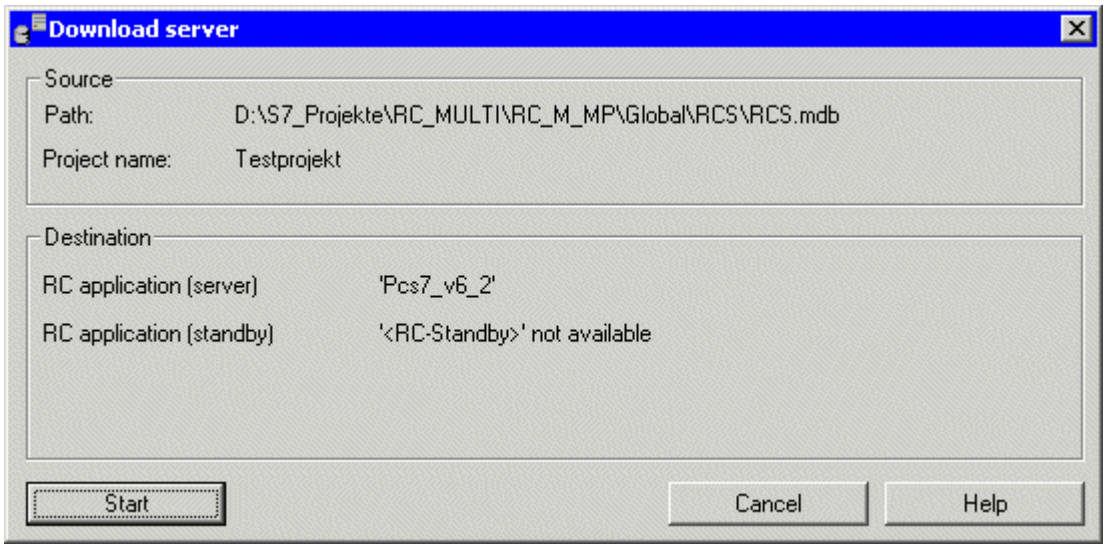
Meaning of Operator Control Elements

Operator Control Element	Meaning
Name	Name of location type. Unit-related locations can be of different types; they can be configured as intake, discharge or other types. This setting in only relevant if the SIMATIC Sync Coordinator comes into operation. This is not yet the case in SIMATIC Route Control V6.1. *Note: Standard types cannot be changed. Only user-defined types can be changed.*
ID	Type number that is unique from all others *Note: Standard types cannot be changed. Only user-defined types can be changed.*
Comments	User text

A.16 Loading Server

A.16.1 Loading the Route Control Server

Dialog



Description

This dialog is used to load the Route Control project engineering onto the Route Control server computer(s). Note that the new project engineering will not become active immediately. Rather, it must first be activated using the Route Control Center. See also Route Control Center: Server Status' Enable' Function.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Path	Route Control project engineering (path to file) to be copied to the server
Project name	Project property, see Global Settings
RC application (server)	Name of computer configured as the Route Control master (This is a standalone server in the case of non-redundant computers)
RC application (standby)	Name of computer configured as the Route Control standby (For redundant computer pair only)
Start	Starts the copy operation. A progress bar is displayed. At the conclusion, an information dialog is displayed indicating the result of the copy operation.
Cancel	Closes this dialog box without changes. The project engineering is not copied.

Operator Control Element	Meaning
Help	Calls the online Help for this dialog

A.17 Route Control Wizard (Export)

A.17.1 Route Control Wizard: Actions

The Route Control Wizard can assist the user in performing a range of recurring tasks. In addition, it ensures that the data relevant to Route Control are consistent.

See also Route Control Wizard: Start Requirements

Selection	Action
Data synchronization of RC objects/plausibility check	Transfer the plant hierarchy, including process cells and units, from the S7 project to the Route Control project for subsequent project engineering of plant-related locations.
Data synchronization of RC objects/plausibility check	Check and correct, as necessary, the element IDs for an AS. The wizard suggests a new ID if an illegal ID was configured in an element.
Data synchronization of RC objects	Transfer new element types, such as MYMOTOR
Data synchronization of RC objects/plausibility check	Check and correct, as necessary, the IDs of automation systems relevant to Route Control. Transfer the AS names and IDs to the Route Control project engineering
Generate S7 connections / AS-AS cross-coupling information	Establish and modify the communication links between the automation systems relevant to Route Control (AS-AS connections)
Generate S7 connections / AS-OS connection information	Establish and modify the communication links between the automation systems relevant to Route Control and the servers (AS-OS connections)
Export message server	The user must select a WinCC message server for use by the Route Control server(s) during runtime to generate messages. When the selection is made, the name of the WinCC message server (two computer names in the case of a redundant system) is exported to the Route Control project so the Route Control server knows which WinCC message server to report to once the project is enabled.
Generate messages	If this option is selected, the messages for the Route Control server are generated in the WinCC OS project once you have selected the WinCC message server in one of the subsequent dialogs (see above). These two settings have been separated because messages do not always have to be generated (for example, when only the name of the WinCC OS computer has changed).

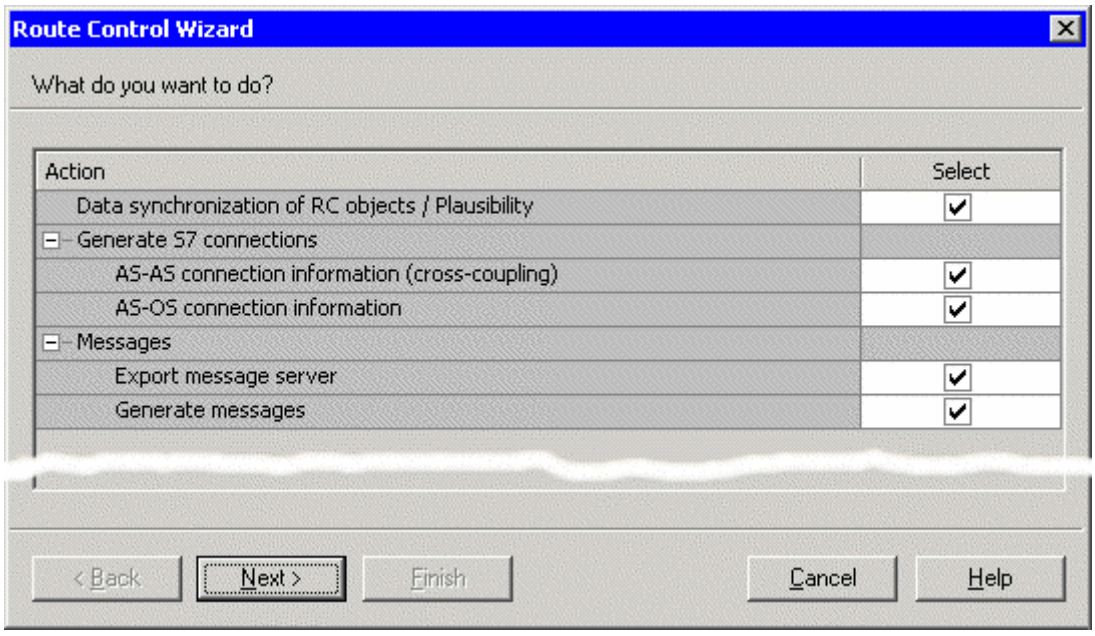
Note

AS-AS and AS-OS connections:

In order for the Route Control Wizard to create the connections, the automation systems and their network cards must already have been configured in NetPro (HW Config).

A.17.2 Route Control Wizard: Selecting Actions

Dialog



Meaning of Operator Control Elements

Operator Control Element	Meaning
'Action' column	Tasks the Route Control Wizard can perform for you For more information on this column, refer to Route Control Wizard: Actions
'Selection' column	☑ The wizard will perform these tasks ☐ The wizard will not perform these tasks
Next	This brings you to the next dialog
Cancel	The wizard will be canceled. No changes will be made to the data, and no data will be imported or exported.
Help	Jump to online Help

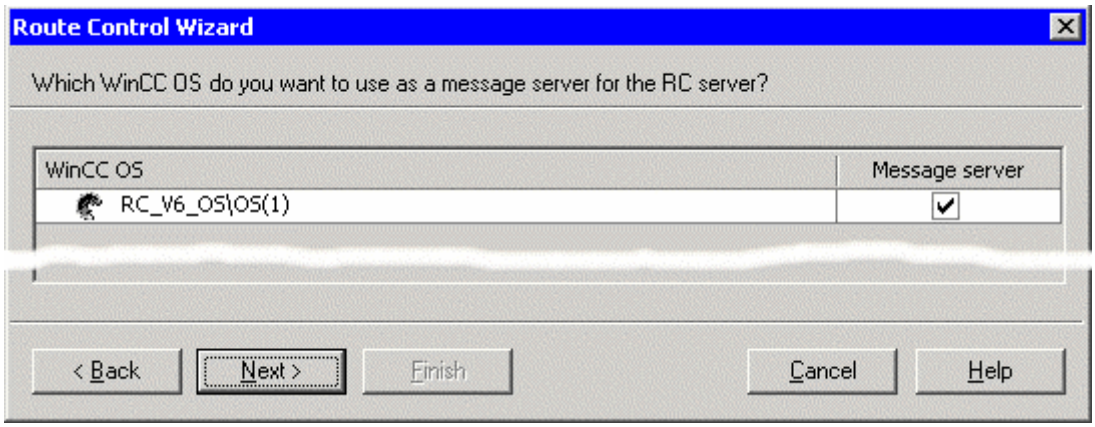
Note

A selection cannot be made in the "Export" column unless the "Selection" column has been selected; that is, an export always requires a selection.

This ensures that inconsistent data are not exported, as an ID check (plausibility check) must be performed prior to an export.

A.17.3 Route Control Wizard: Selecting a WinCC Message Server

Dialog



Meaning of Operator Control Elements

Operator Control Element	Meaning
'WinCC OS' column	List of all WinCC OS servers that the wizard found in this project. Each OS can become a message server for the Route Control server(s), but only one WinCC OS in total.
'Message server' column	☑ This WinCC OS becomes a message server for Route Control server messages ☐ This WinCC OS will not become a message server for Route Control messages

A.17.4 Route Control Wizard: AS-OS Connection (MAC Address)

Dialog

This dialog has been obsolete in RC V6.1 since the required information is automatically determined, see

Route Control Wizard: Network Constellations

Route Control Wizard: Network Constellations (Examples)

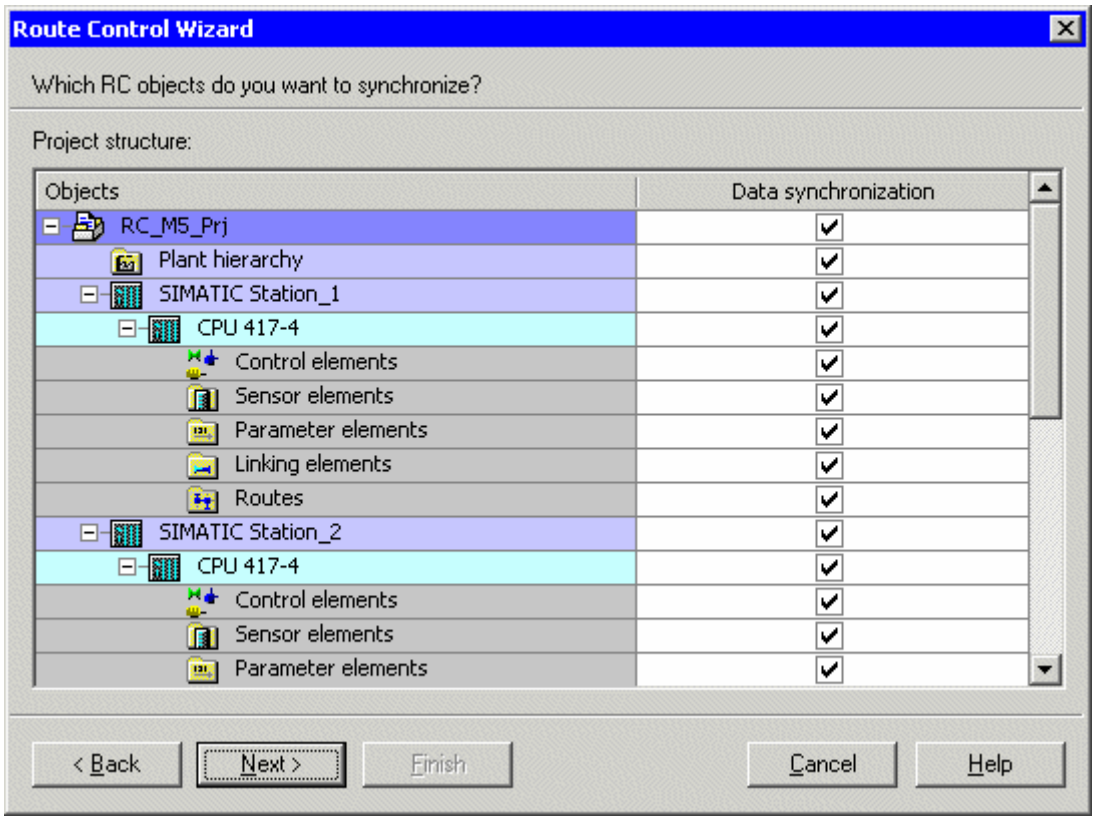
Route Control Wizard: Network Constellations (Note)

A.17.5 Route Control Wizard: AS-OS Connection (TCP/IP Address)

This dialog is no longer needed as of Route Control V6.1 SP1 and is therefore no longer shown since the Route Control Wizard automatically reads and takes RC applications from the hardware configuration. The connection properties such as the TCP/IP or perhaps the MAC address are therefore also made automatically..

A.17.6 Route Control Wizard: Selecting Objects To Be Exported

Dialog

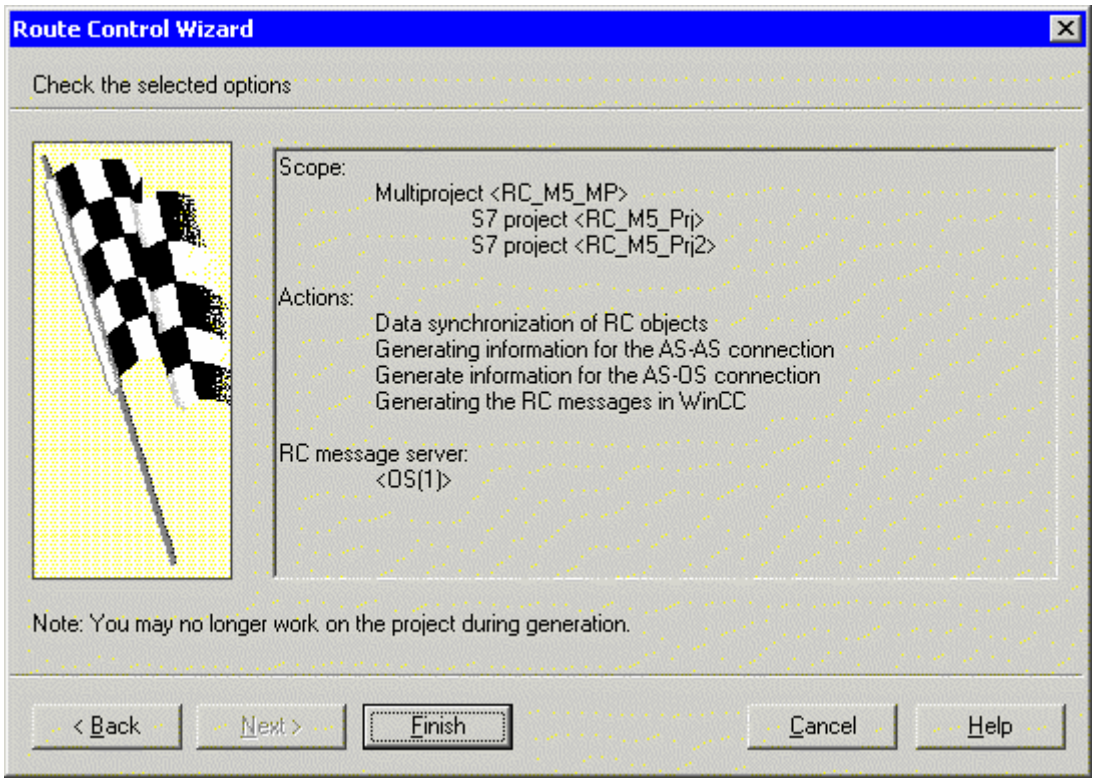


Meaning of Operator Control Elements

Operator Control Element	Meaning
'Objects' column	Objects from the S7 project that can be transferred to the Route Control project engineering. Elements can be exported as a group only and not as an individual instance.
'Data synchronization' column	☑ Objects / object group will be exported ☐ Objects / object group will not be exported Selecting a CPU or an S7 project will also select all of the low-level objects.
Next	This brings you to the next dialog
Cancel	The wizard will be canceled. No changes will be made to the data, and no data will be imported or exported.
Help	Jump to online Help

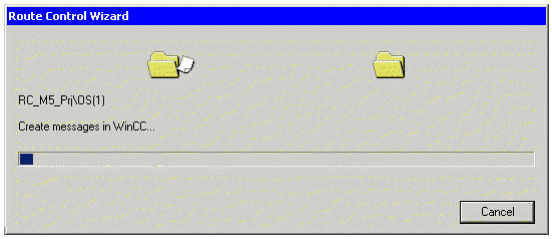
A.17.7 Route Control Wizard: Summary

Dialog



Description

As a final step, this dialog lists the actions that the Route Control will execute when you click 'Finish.' Afterwards, a progress bar is displayed showing the progress of each action as it is being performed.



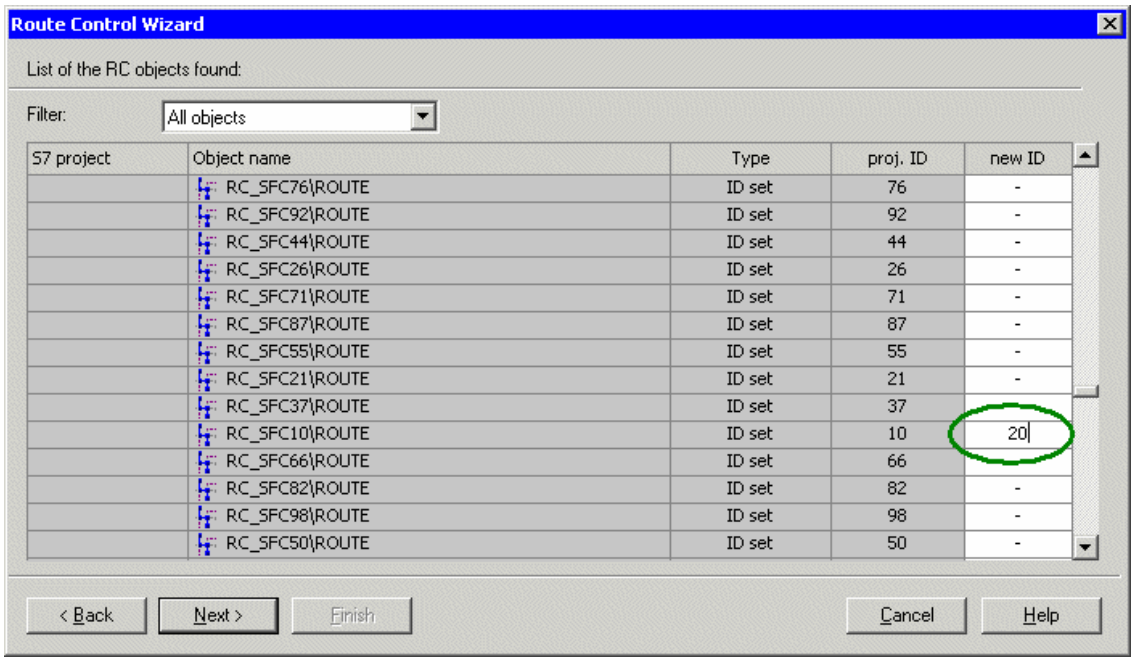
Meaning of Operator Control Elements

Finish	Start the data synchronization and export.
Cancel	The wizard will be canceled. No changes will be made to the data, and no data will be imported or exported.

Finish	Start the data synchronization and export.
Help	Jump to online Help

A.17.8 Route Control Wizard: Adapting IDs

Dialog



Description

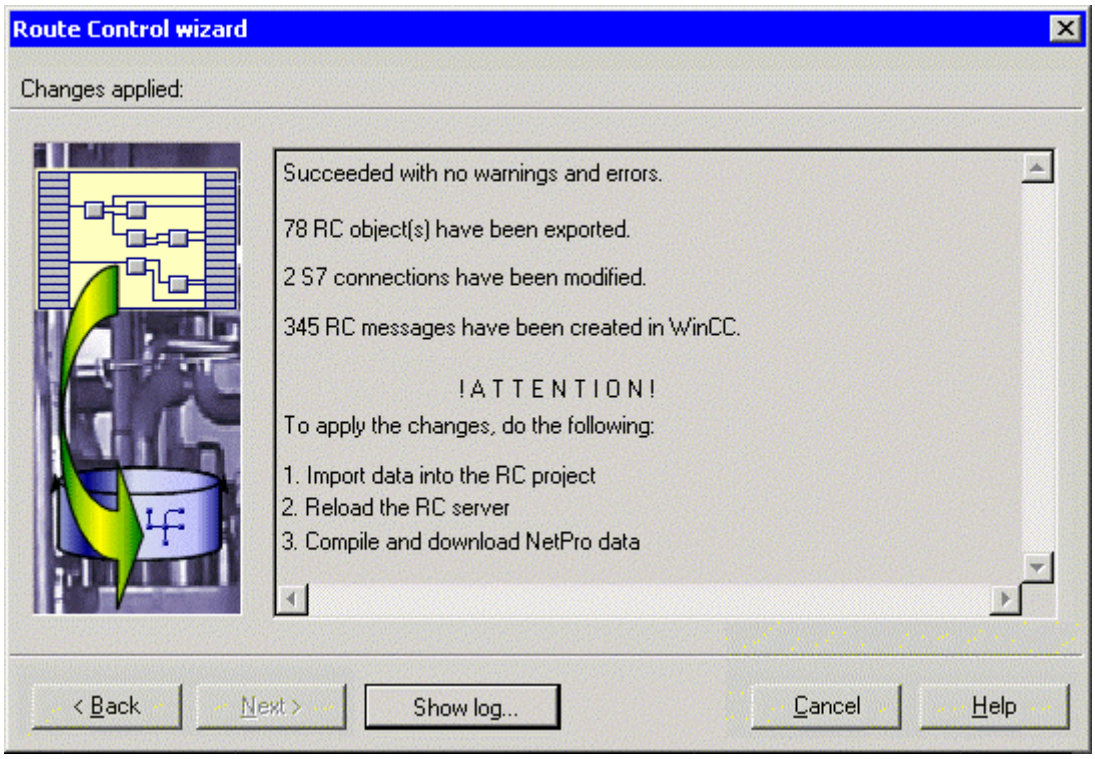
The Route Control Wizard has performed a plausibility check and displays the results here. The route IDs for routes can be adapted here. The wizard suggests suitable IDs or selects faulty entries.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Filter	The following filter criteria are available: Routes All objects Faulty elements Modified elements
'S7 project' column	S7 project in which the wizard has found and checked the following elements.
'Object name' column	Instance of element = CFC chart name and instance name of the block in the CFC chart
'Type' column	Element type, that is, 'subtype' (for example, a MOTOR or VALVE for a control element). This type is specified in the blocks as a UDA with the UDA name 'S7_SUBTYPE.' This UDA can also be configured for user blocks; user blocks will then be displayed here.
Next	This brings you to the next dialog
Cancel	The wizard will be canceled. No changes will be made to the data, and no data will be imported or exported.
Help	Jump to online Help

A.17.9 Route Control Wizard: Result

Dialog



Description

This dialog summarizes and displays the results of the actions performed. If errors occurred, you should display the log.

If changes were made in NetPro or to the CFC charts, they must be compiled and downloaded to the AS so that Route Control can 'go online again.'

If objects (elements, routes, plant hierarchy, etc.) were exported, they must be transferred to the Route Control project engineering and loaded onto the Route Control server using the Route Control import wizard. See also Route Control Wizard: Import.

Meaning of Operator Control Elements

Display log	Opens the text editor containing the log file.
Close	The wizard is closed.
Help	Jump to online Help

A.17.10 Route Control Wizard (Export Log)

File Name

RC_EXPORT_ASSISTANT.LOG

File Location

The log file is stored in the same path where the Route Control project database is located. See Storage of Route Control Project.

File Segments

Export wizard log (Vx.y):

1. Global data of the operation; x.y is the version of the data structure in the export file. The export and import wizards must work with files of the same version.
2. Multiproject: The Route Control Wizard was called in the S7 project path context indicated here.

Reading of project structure:

3. This segment provides information on the S7-400 CPUs and OSs (WinCC) found by the wizard

Selection of export options:

4. Here you see the actions you selected in the first dialog box for the wizard to perform

Selection of RC objects:

5. The objects/object groups (such as CE, PE, SE, LE, and routes) to be exported from an AS are specified here (filter)

Reading the instances:

6. A list of the elements (instances of elements, routes, and plant hierarchy) that were found in this project is shown (restricted by the filter indicated above).

Export:

7. The exported objects are itemized first.
8. Then, information is provided indicating whether the ID of an element has to be modified, and if so, which new ID is suggested

A.18 Network Combinations

A.18.1 Route Control Wizard: Network Constellations

Network Cards and Connections

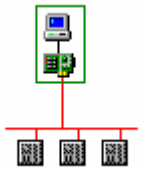
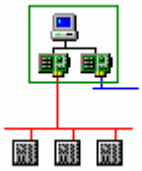
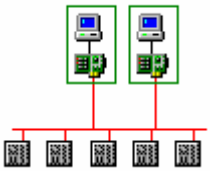
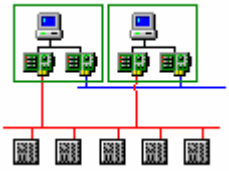
Route Control supports four constellations for arrangement of Route Control servers and use of networks for communication between OS-AS and OS-OS. The number of automation devices in the figures below are intended as an example only.

See also:

Route Control Configurations

Route Control Configurations (non-redundant)

Route Control Configurations (redundant)

Case	Constellation	Description
1		One Route Control server with one network card that is used for both OS-OS and OS-AS communication. In this case, all communication runs over *one* network, that is, there is no separation between the office bus and the terminal bus.
2		One Route Control server with two network cards, one for OS-OS communication and another for OS-AS communication.
3		Two Route Control servers (redundant server pair) with one network card each. In this case again, all communication runs over *one* network, that is, there is no separation between the office bus and the terminal bus.
4		Two Route Control servers (redundant server pair) with two network cards each, one for OS-OS communication and another for OS-AS communication.

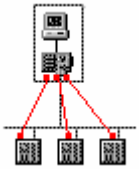
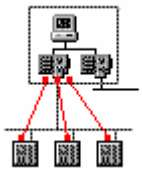
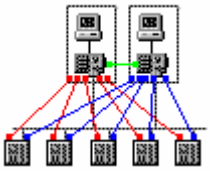
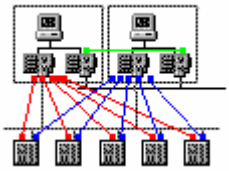
A.18.2 Route Control Wizard: Network Constellations (Examples)

See also:

Route Control Configurations

Route Control Configurations (non-redundant)

Route Control Configurations (redundant)

Case	Process cell	Connections
1		3 AS-OS connections: NetPro: one each per AS configured OS connections: This is not a redundant server, so the second network card is used, for example, for communication with the clients.
2		3 AS-OS connections: NetPro: one each per AS configured OS connections: In addition, the IP address of the second network card must be specified to the office network. This is not a redundant server, so the second network card is used, for example, for communication with the clients.
3		2 x 5 AS-OS connections: Two AS-OS connections go from each AS to the Route Control servers. OS-OS connection: A common network is being used, so the IP address does not have to be specified to the office network.
4		2 x 5 AS-OS connections: Two AS-OS connections go from each AS to the Route Control servers. OS-OS connection: In addition, the IP addresses of both network cards in computers 1 and 2 must be specified to the office network (green connection).

A.18.3 Route Control Wizard: Network Constellations (Note)

Note

The Route Control Wizard can only create S7 connections to PLCs that are in the same S7 project or multiproject (limit of a Route Control project).

Connections to automation devices in S7 projects outside this domain (for example, other independent, individual S7 projects not encompassed in the multiproject, or a second S7 multiproject, etc.) must be configured manually by the user!

A.19 Server Combinations

A.19.1 Route Control Server with and without WinCC OS

The Route Control server can be started with or without WinCC. The appropriate settings can be made under Global Settings.

A.19.2 Route Control Configurations

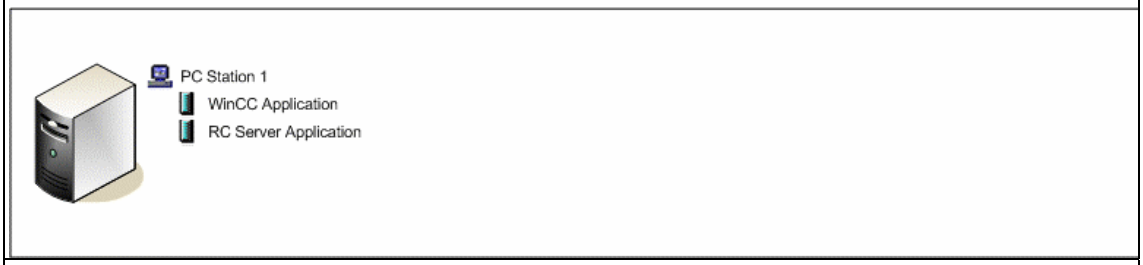
The following configurations are permitted for Route Control, WinCC and/or Batch Control:

Route Control Configurations (non-redundant)

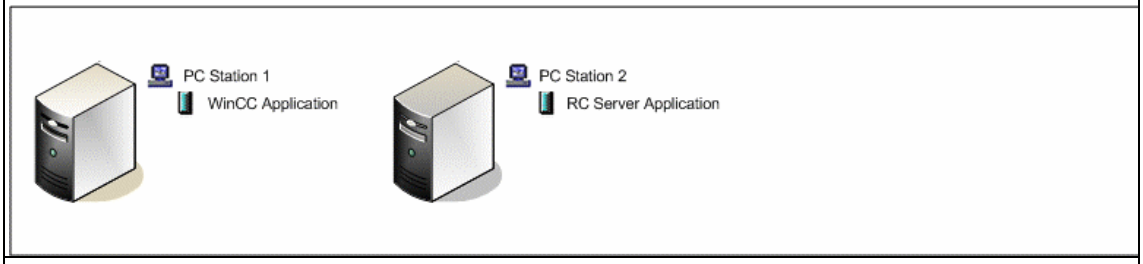
Route Control Configurations (redundant)

A.19.3 Route Control Configurations (non-redundant)

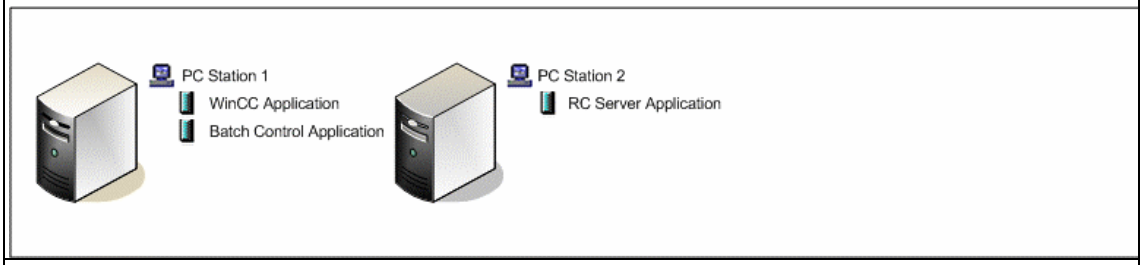
Project Engineering



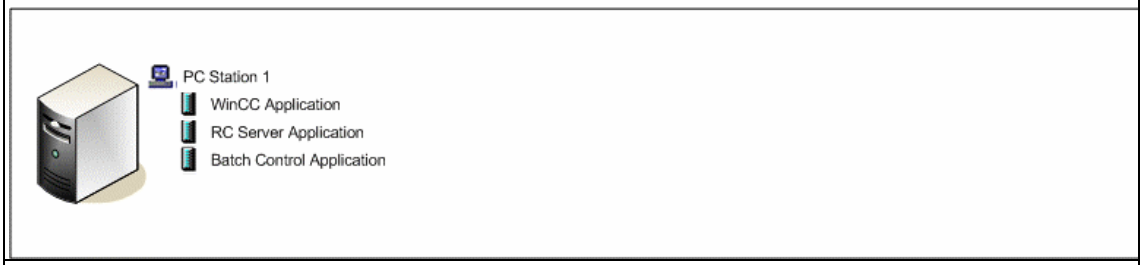
Batch Control optionally on a second station



WinCC Server is the message server for Route Control server messages.



WinCC Server is the message server for Route Control server messages.



Limitation:

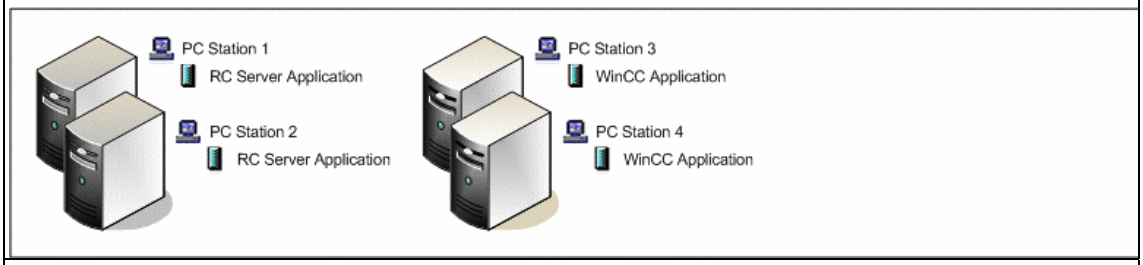
Batch: 300 process objects

WinCC: 64k tags

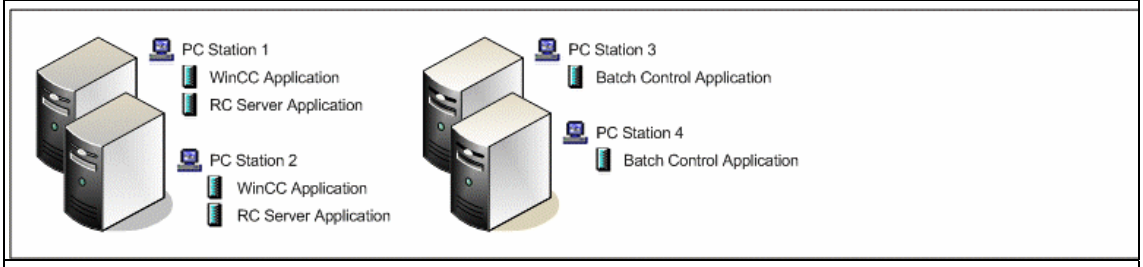
RC: 100 routes

A.19.4 Route Control Configuration (redundant)

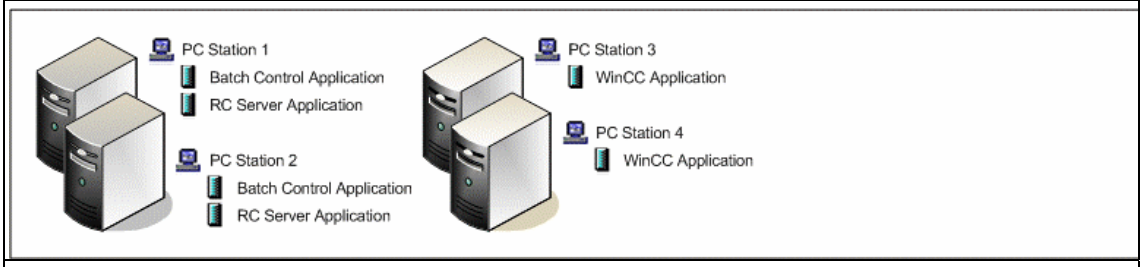
Project Engineering



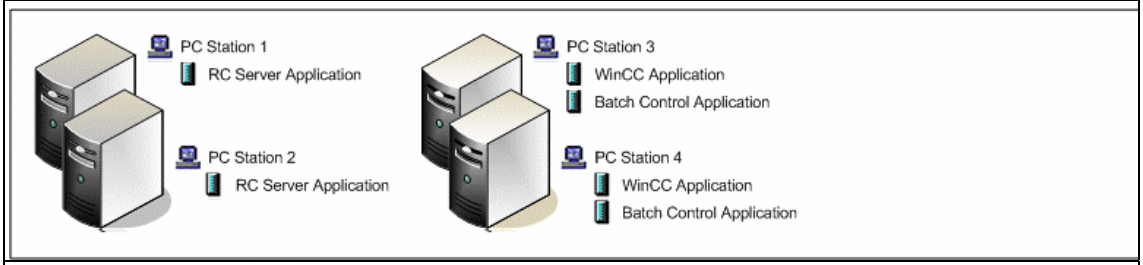
Route Control uses its own redundancy monitoring.



With or without SIMATIC Batch Control server pairs
Route Control uses standard PCS 7 redundancy.

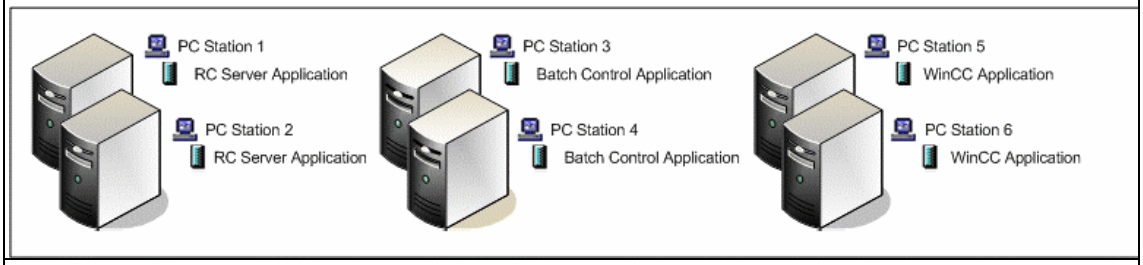


RC uses its own redundancy monitoring.
Batch uses standard PCS 7 redundancy monitoring.



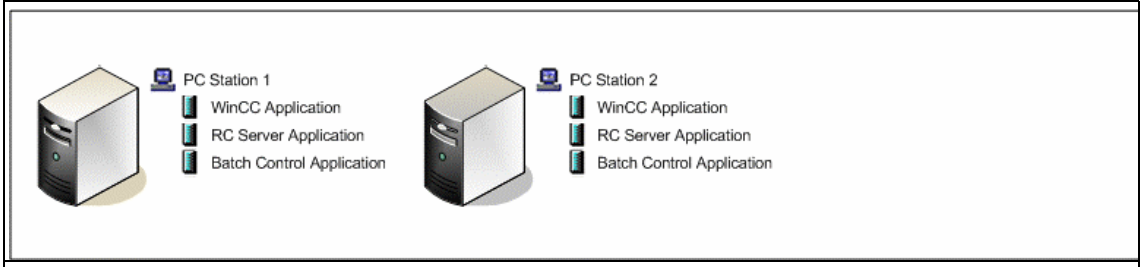
RC uses its own redundancy monitoring.
Batch Control and WinCC use standard PCS 7 redundancy monitoring.

Project Engineering



RC uses its own redundancy monitoring.

Batch Control and WinCC use standard PCS 7 redundancy monitoring.



Limitation:

Batch: 300 process objects

WinCC: 64k tags

RC: 100 routes

Alle Applikationen verwenden die PCS 7-Standard-Redundanz

A.20 Route Control Wizard (Import)

A.20.1 Route Control Wizard: How Synchronization Works

Objects that have already been created by the wizard in the Route Control project during an earlier import and that are contained in the current import file (possibly with modified properties) are updated.

Objects that have already been created by the wizard in the Route Control project during an earlier import and that are not contained in the current import file are deleted provided their group (CS, SE, etc.; routes, plant hierarchy, etc.) was selected during the export.

Objects that were manually created in the Route Control project are neither deleted nor modified by the wizard.

Objects in the import file that were not previously included in the Route Control project are created.

The process cell and unit objects (plant hierarchy) have an internal key that enables the wizard to recognize these objects. For example, if a process cell or a unit is renamed and locations were already assigned to this unit, this interconnection is not lost.

Caution

The user should not assign IDs to Route Control objects in the CFC charts. Rather, the Route Control Wizard should be called. This ensures consistent data.

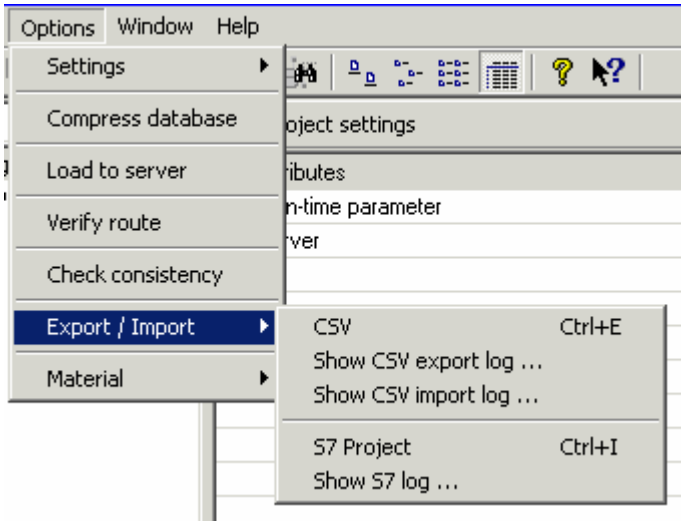
The ID is also the key for these objects. For example, if you assign another ID to an AS, this AS is then recognized as a "new" AS and the old AS as a "deleted" AS. The interconnections of elements from this AS in the Route Control engineering tool can then be lost.

For renaming a process cell or unit, refer to the note on the recommended procedure in Renaming a Process Cell or Unit in the Plant Hierarchy

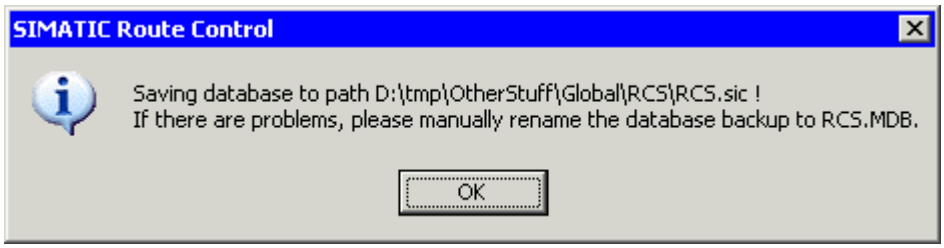
A.20.2 Route Control Wizard: Import

The Route Control Wizard for the Route Control engineering tool can be used to transfer the previously exported data to the Route Control project engineering.

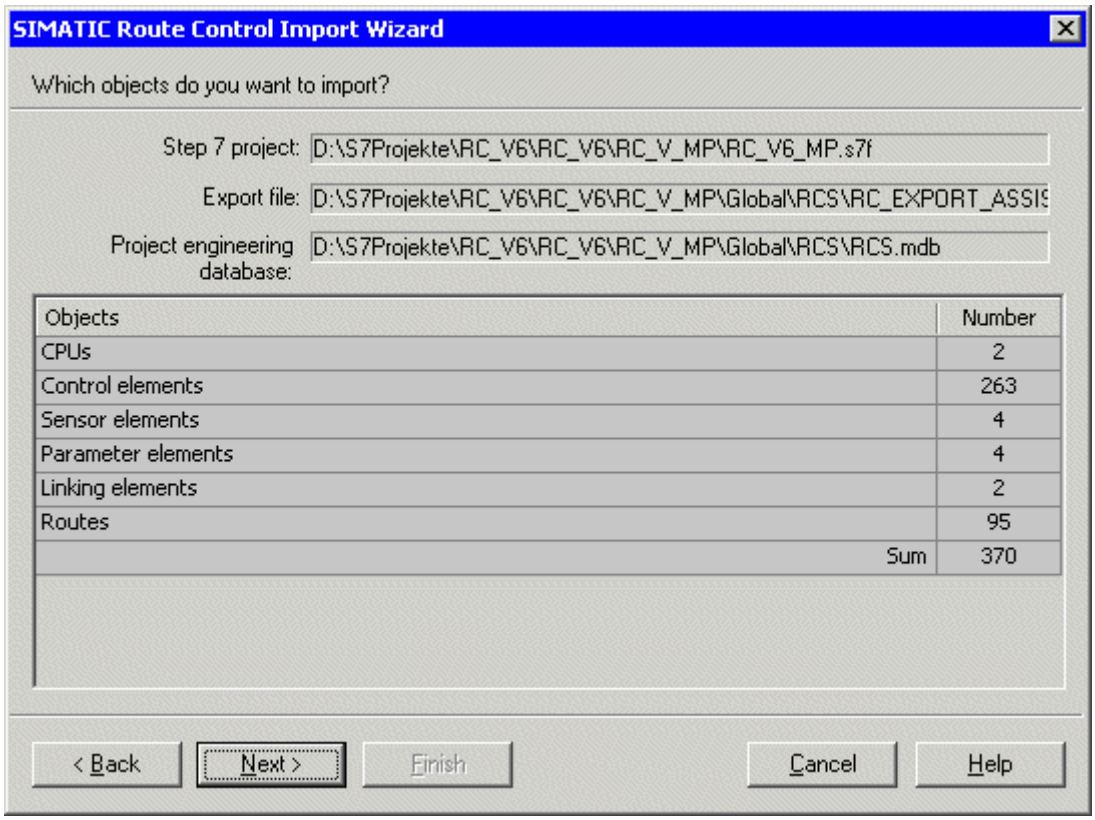
Open the import wizard by means of the menu in the engineering tool.



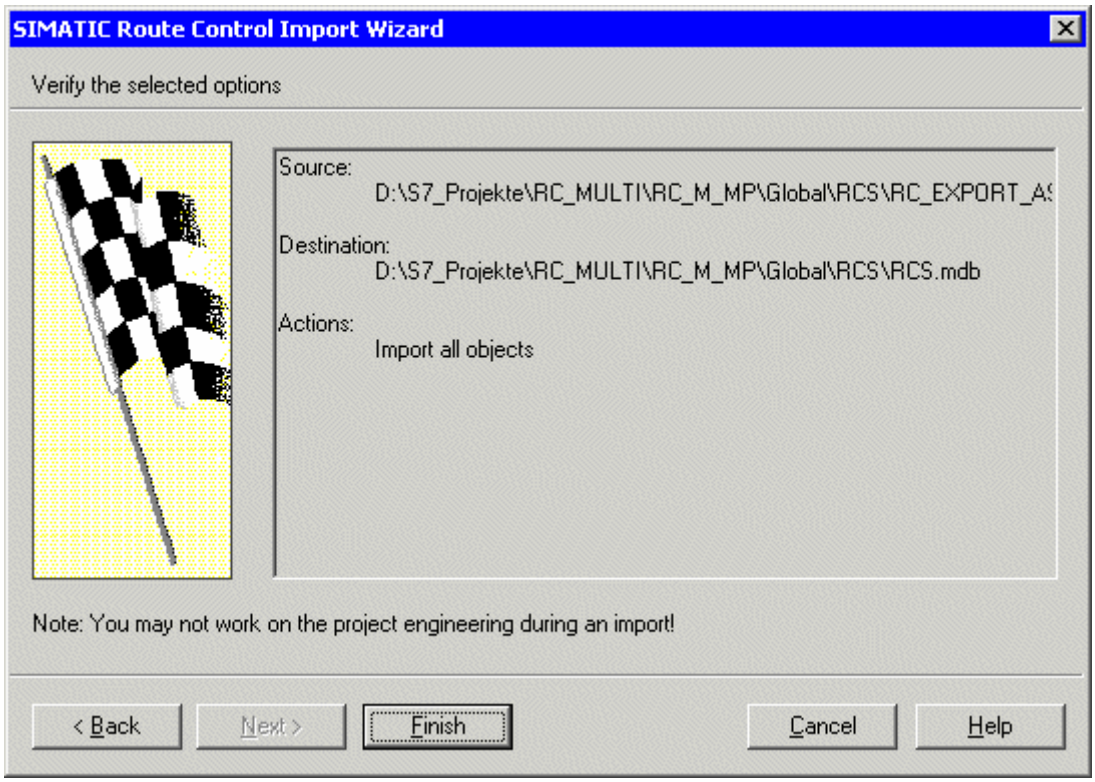
First a note is displayed indicating that the database will be backed up. If an unexpected error occurs, you can retrieve the old database file for restoration.



In the next dialog, you select the data to be imported. The wizard offers only those data that were previously exported.



A final dialog displays all of the settings again; click "Finish" to start the import operation.



A.20.3 Route Control Wizard (Import Log)

File Name

RC_IMPORT_ASSISTANT.LOG

File Location

The log file is stored in the same path where the Route Control project database is located. See Storage of Route Control Project.

File Segments

Import wizard log (Vx.y):

1. Global data of the operation; x.y is the version of the data structure in the export file. The export and import wizards must work with files of the same version.
2. User who initiated the import operation.
3. Import file: The path to the import file being read is specified here
4. Project engineering database: The Route Control project database where the export file contents are to be incorporated is specified here.

Options:

5. Actions to be performed by the Import wizard are specified here

List of all objects:

6. Basic overview of objects that were found in the file
7. S7 connections: Number of S7 connections found (AS-Route Control server connections)
8. OS: Number of Route Control servers specified during the export and for which parameters were assigned.

Import:

9. Project engineering database opened: For safety, the path to the project database of the Route Control project is displayed once again.

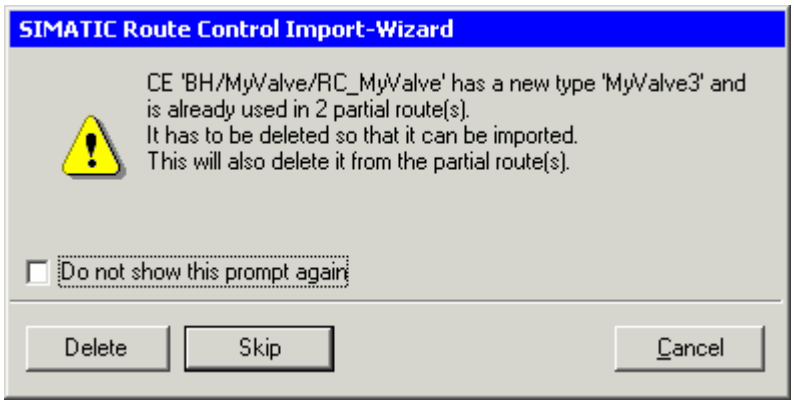
Import all objects:

10. Detailed information on the S7 connections and the Route Control servers is shown.

Delete objects that no longer exist:

A.20.4 Deleting Used Elements

Dialog



Meaning

If you have changed elements in a CFC chart (element type) and want to use the Route Control Wizard to transfer them to the Route Control project engineering, a notice appears during the import operation indicating that the element is currently being used in partial routes.

If the element type has changed, the element must be interconnected again in the partial route because the properties of the interconnected element must also be specified again

In this dialog, you can choose whether to delete the element or skip this step for the particular element. The dialog will be displayed again for the next element unless you suppress it by selecting "Do not show this prompt again."

Note

If you have selected "Do not show this prompt again" and then click "Delete" or "Skip," this choice is applied to all future prompts that may occur for this import operation.

You can have the dialog displayed again by selecting Settings \ Enable System Messages on the Options menu.

A.21 Route Control Block Icon

A.21.1 RC Block Icon Interconnection

The block icon can be interconnected to a route instance using a WinCC dynamic wizard for Route Control faceplates.

The individual steps can be found in:

Route Control: WinCC Wizard (Instance Selection)

A.22 Route Control WinCC Wizard

A.22.1 Route Control: WinCC Wizard (Overview)

Description

The Route Control dynamic wizard assists you when interconnecting a Route Control faceplate to a route instance and an SFC block that activates a route.

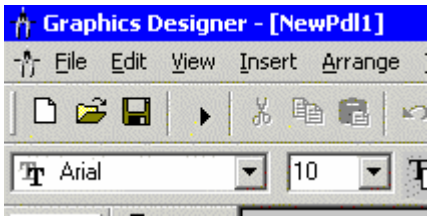
Individual Steps

Step	Description
1	Open the WinCC Graphic Designer from the WinCC Explorer
2	In the Graphics Designer, open the @PCS7TypicalsRC.pdl file (File \ Open)
3	Copy the Route Control block icon contained in this file (Select \ Copy)
4	Switch to your WinCC picture and paste the copied block icon in the WinCC picture.
5	Start the dynamic wizard. If this wizard is not visible, you can activate it by right-clicking the free range under the control elements and selecting the check box for the dynamic wizard in the next dialog.
6	Select the "RC Faceplates" tab in the dynamic wizard window and then double-click the "RC Faceplate Wizard" entry.
7	The first dialog of the Route Control faceplate wizard is displayed. You can hide this dialog for future interconnections.
8	Continue to the next dialog and select the instance of the route block to which this block icon is to be interconnected.
9	In the third dialog you have the option to select an SFC block to which this block icon is to be interconnected. If you interconnect an SFC block, an SFC dialog can be opened during runtime to display the SFC chart controlling the route.
10	The final dialog summarizes all of your settings; click "Finish" to create the selected interconnections.

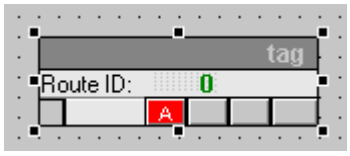
A.22.2 Route Control: WinCC Wizard (Start)

Steps 1 to 4:

1. Open the WinCC Graphic Designer from the WinCC Explorer



2. In the Graphics Designer, open the @PCS7TypicalsRC.pdl file (File \ Open)
3. Copy the Route Control block icon contained in this file (Select \ Copy)



4. Switch to your WinCC picture and paste the copied block icon in the WinCC picture.

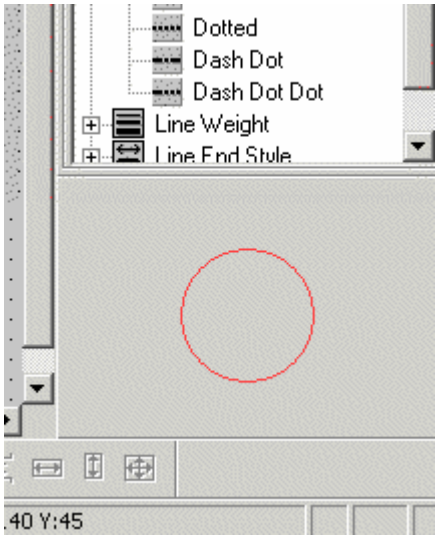
Note

The @@RCTypicals.pdl file has been renamed in V6.1 to @PCS7TypicalsRC.pdl so that a faceplate (block icon) can be automatically created for the route block (FB800, RC_IF_ROUTE). All files that conform to the syntax @PCS7Typicals*.pdl are found automatically by the system and the faceplates are automatically created.

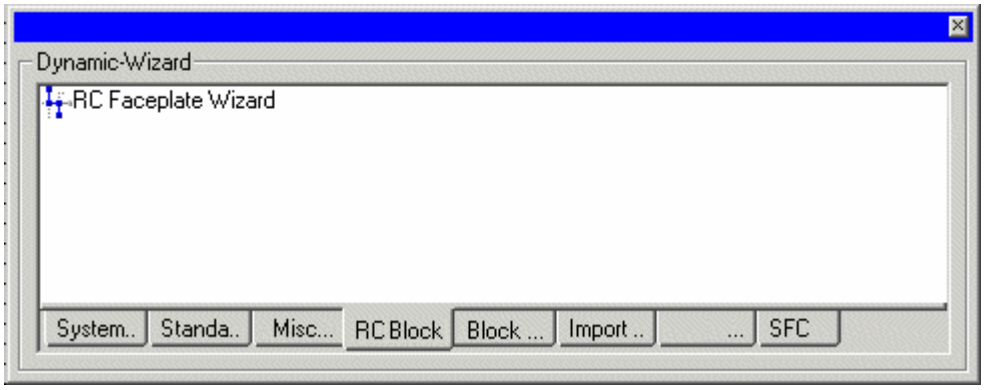
A.22.3 Route Control: WinCC Wizard (Welcome Dialog)

Steps 5 and 6:

5. Start the dynamic wizard. If this wizard is not visible, you can activate it by right-clicking the free range under the control elements and selecting the check box for the dynamic wizard in the next dialog.



6. Select the "RC Faceplates" tab in the dynamic wizard window and then double-click the "RC Faceplate Wizard" entry.



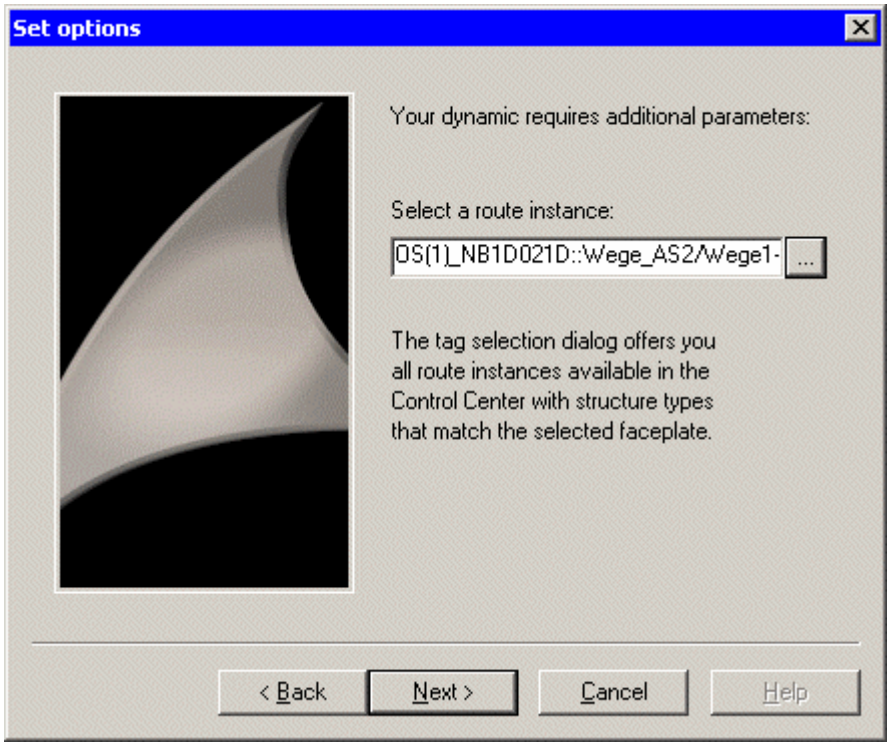
A.22.4 Route Control: WinCC Wizard (Instance Selection)

Note

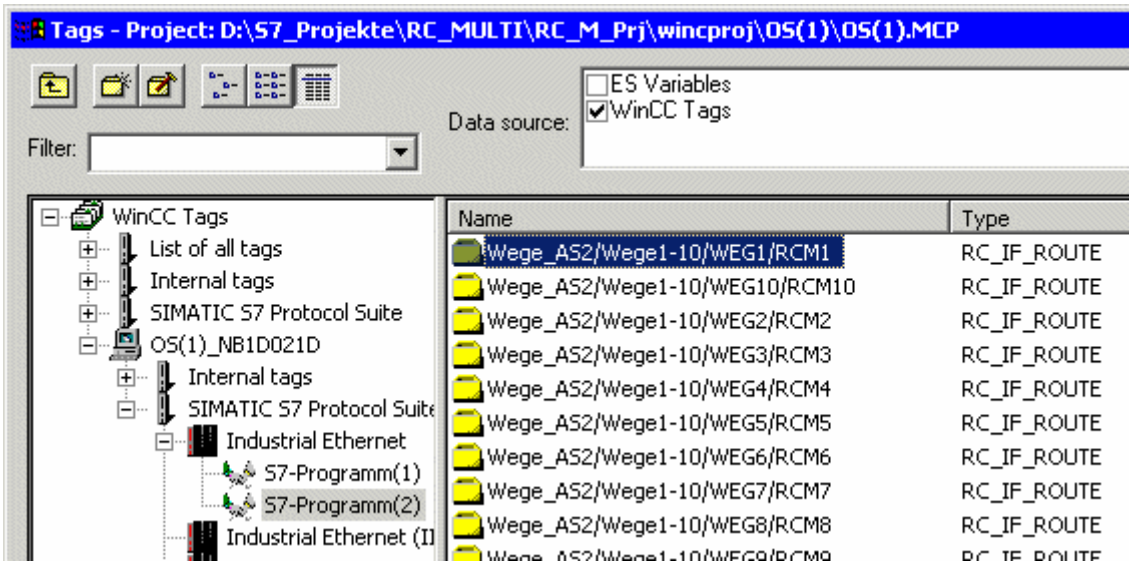
Both the route instance as well as the SFC instance can be interconnected by means of ES tags. Alternatively, the WinCC tags can be interconnected. Preferably, the ES tags should be interconnected.

Steps 7 and 8:

7. The first dialog of the Route Control faceplate wizard is displayed. You can hide this dialog for future interconnections.



8. Continue to the next dialog and select the instance of the route block (RC_IF_ROUTE type) to which this block icon is to be interconnected.



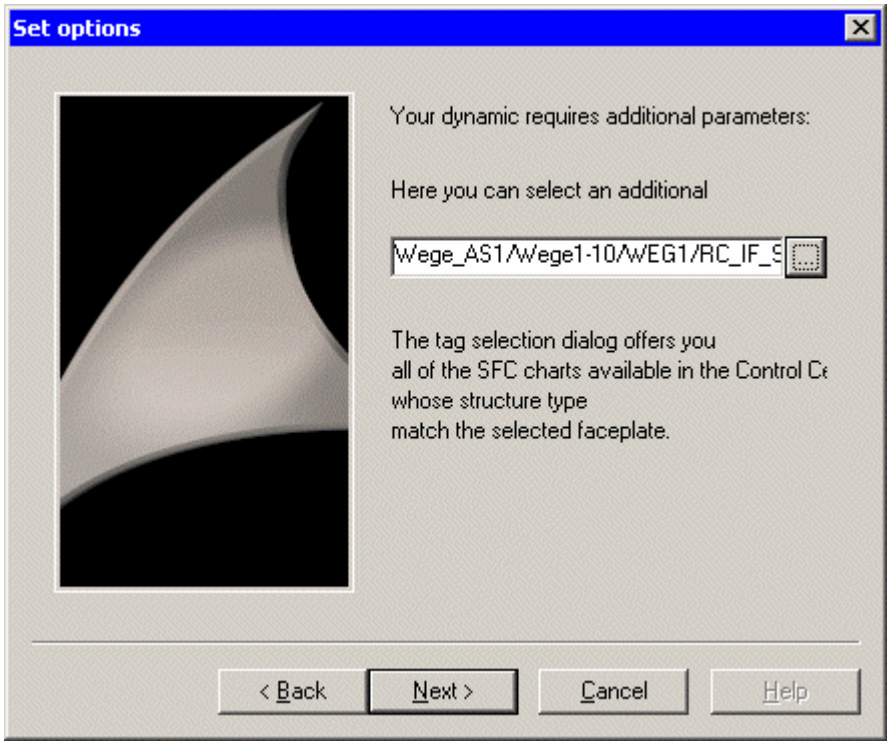
Note

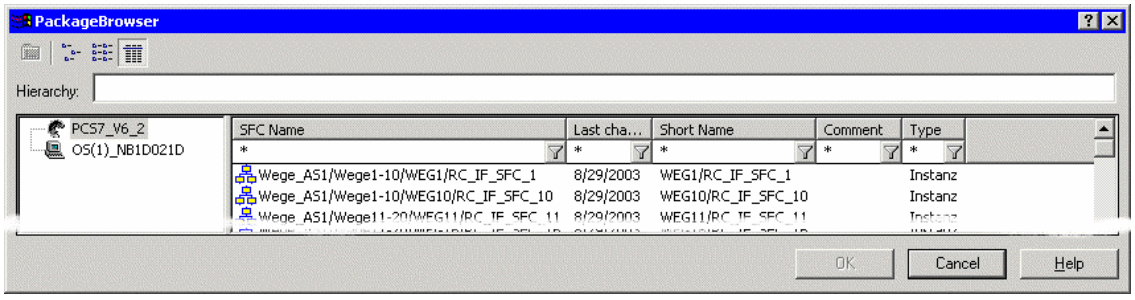
The instances of the RC_IF_ROUTE must have been transferred from the engineering to the OS project beforehand (see AS/OS transfer in SIMATIC Manager).

A.22.5 Route Control: WinCC Wizard (SFC)

Step 9:

In the third dialog you have the option to select an SFC block to which this block icon is to be interconnected. If you interconnect an SFC block, an SFC dialog can be opened during runtime to display the SFC chart controlling the route.

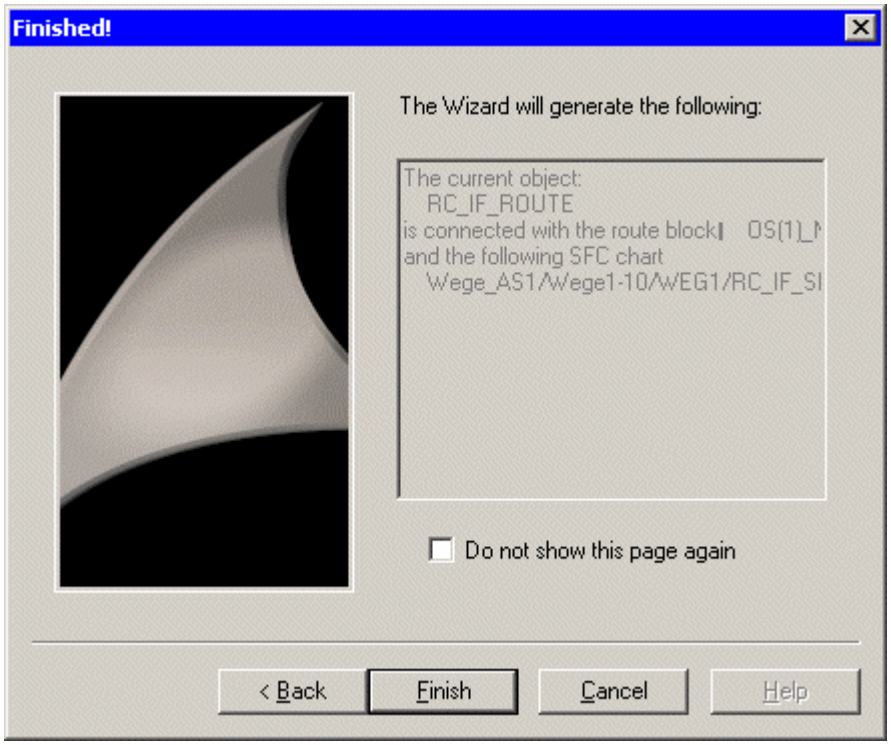




A.22.6 Route Control: WinCC Wizard (Summary)

Step 10:

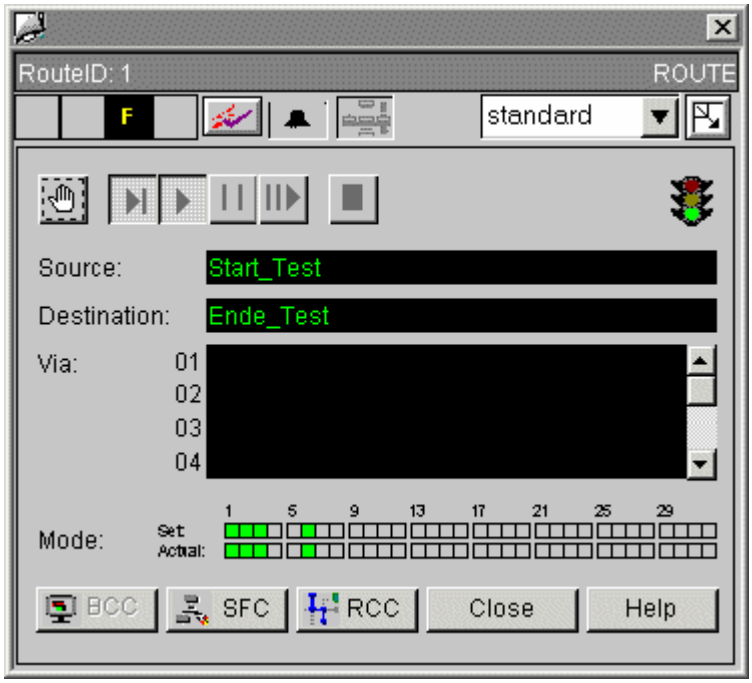
The final dialog summarizes all of your settings. You can deactivate this dialog for future calls. Click "Finish" to create the selected interconnections.



A.23 Route Control Faceplate

A.23.1 RC Route Faceplate

Double-clicking the block icon opens the Route Control faceplate. The Route Control faceplate displays more information and permits a series of route operations depending on the authorization level in WinCC.



Meaning of Operator Control Elements

RC Faceplate (Display and Operator Control Elements) - 1/4

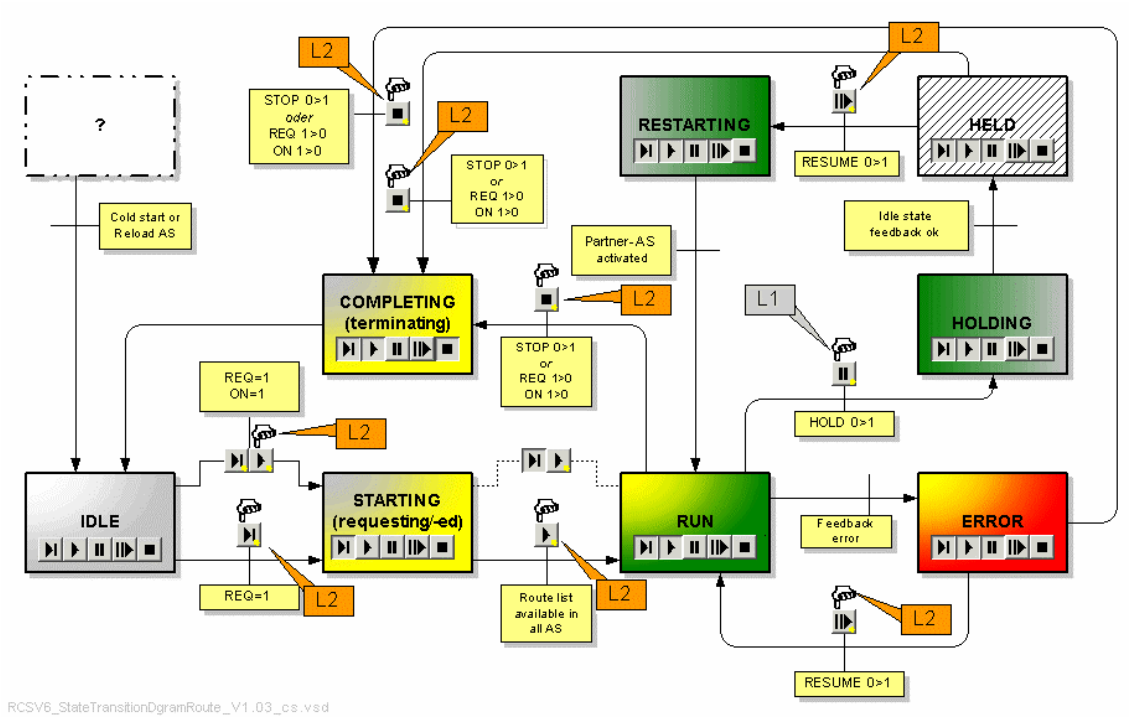
RC Faceplate (Display and Operator Control Elements) - 2/4

RC Faceplate (Display and Operator Control Elements) - 3/4

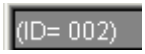
RC Faceplate (Display and Operator Control Elements) - 4/4

A.23.2 RC Faceplate/Status of Route

The Route Control diagram below was developed according to the statuses in the S88 standard. It shows the individual S88 statuses and their transition conditions. In manual mode, the user is responsible for the transitions between the statuses (shown as a hand icon with the corresponding operator control element). In automatic mode, the user program (or the SFC) activates the route and thus triggers the status transitions. L1 and L2 stand for the required user authorization levels. See also User Roles for Route Control.



A.23.3 RC Faceplate (Display and Operator Control Elements) - 1/4



Route ID

If the dynamic ID assignment concept is being used, this ID can vary for each new material transport (route request)

Name of the route block instance of type RC_IF_ROUTE to which the block icon is interconnected

Group display for messages for this route

Route Control does not create any alarm messages!

Route Control does not create any warning messages!

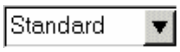
Not used

At least one message for an operator input prompt is pending for this route

Acknowledgment of messages

Messages cannot be suppressed with Route Control

SIMATIC BATCH



Selection of display scope:

Standard:	Normal display with route information
Messages:	Expanded display including route control messages
Batch:	Expanded display including batch information

Expand faceplate dialog

A.23.4 RC Faceplate (Display and Operator Control Elements) - 2/4

Route is in automatic mode

Route is in manual mode

In manual mode: Request route (IDLE → STARTING)

In manual mode: Start route (IDLE → STARTING → RUN)

In manual mode: Hold route (HOLD → HELD)

In manual mode: Complete route (COMPLETE)

Acknowledge error and continue executing the route
(RESUME, that is, HELD → RUN)

		Route is faulty (ERROR)
		Route request is in progress, or route is ready to start (STARTING) or is held (HELD)
		Route has started and elements will be activated (RUN)

A.23.5 RC Faceplate (Display and Operator Control Elements) - 4/4

Mode:

The individual mode levels (32 in 8 blocks containing 4 bits each) are represented as small squares. The upper line indicates the command, thus the setpoint. The lower line indicates the actual value, that is, the mode levels actually achieved.

The upper line indicates the specified state, that is, the state of each individual mode level from 1 to 32:

Green:	Mode level is activated, and all elements will be activated.
Gray:	This mode level is not activated or deactivated, and elements will be deactivated.
(Yellow:	not used)
(Red:	not used)

The lower line indicates feedback for the 32 mode levels:

Yellow:	Mode level is currently being activated
Green:	Mode level is achieved
Red:	Mode level could not be activated within the monitoring time (error status)
Gray:	This mode level is not activated and thus is not supplying any feedback.
	Mode level will not be activated.
	Mode level is being activated; an attempt will be made to activate the elements according to their placement.
	Mode level could not be activated because the set position of one or more of the elements involved could not be assumed within the switch-on monitoring time.
	Mode level and thus all of its elements have been activated and have assumed their set position.
	Element has left its idle state and the fault tolerance time has elapsed.

Other applications and dialogs can be opened using the buttons at the bottom of the dialog box.

BCC	Opens the BATCH Control Center, provided it is installed on this computer.
SFC	Opens the SFC dialog and indicates the current status of the SFC controlling this route. The path to the corresponding SFC must have been configured on the RC faceplate beforehand.
RCC	Opens the Route Control Center containing additional details on this route (including all of the elements and the status of each element).
Close	Closes this dialog box.
Help	Calls the online Help for this dialog.

A.23.6 RC Faceplate (Display and Operator Control Elements) - 3/4

Source: SourceLocation

Display of (plant-related or plant-neutral) source location name in plain text

Destination: Dest. Location

Display of (plant-related or plant-neutral) destination location name in plain text

Via: 01 Via1-Node
02 Via2-Node

Display of (plant-related or plant-neutral) "via" location name in plain text

Note

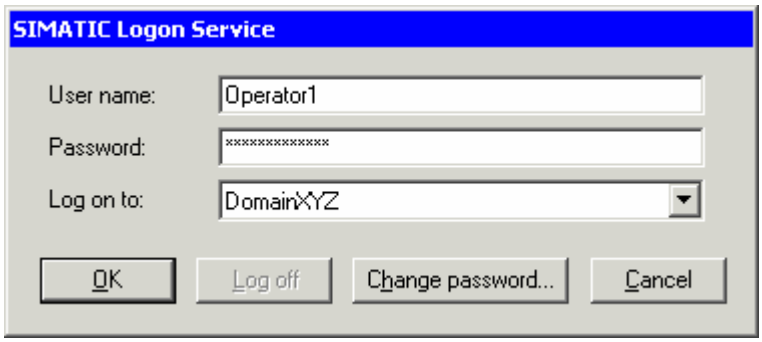
The locations cannot be changed using the faceplate; to change the locations, the Route Control Center must be opened (see below). The scroll bar on the right can be used to bring the other "via" locations into view.

A.24 Route Control Center

A.24.1 Start und Logon

A.24.1.1 Route Control Center: Logon

Before you can execute functions in the Route Control Center, you must be authenticated.



A.24.1.2 Route Control Center: Selection of Route Control Server

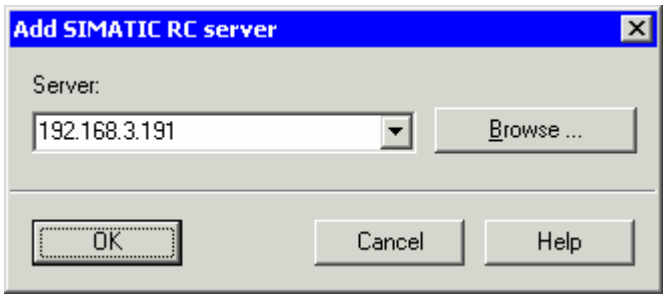
Note

If you have configured the station on which a Route Control Center is running as an "RC application client" in HW Config and downloaded this configuration from the SIMATIC Manager to the client station, you no longer have to select the Route Control server in the following dialogs.

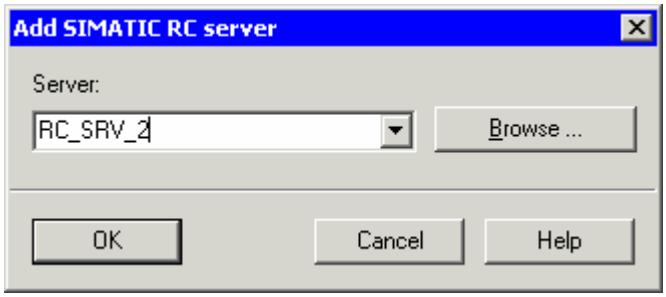
If you have downloaded the configuration from the engineering system to the Route Control client, then the Route Control Center automatically selects one of the two Route Control servers at startup. If the configuration has not yet been downloaded, you can select a Route Control server manually. The Route Control server can then be selected with:

The Route Control server can be selected using:

- IP address of computer



- Computer name



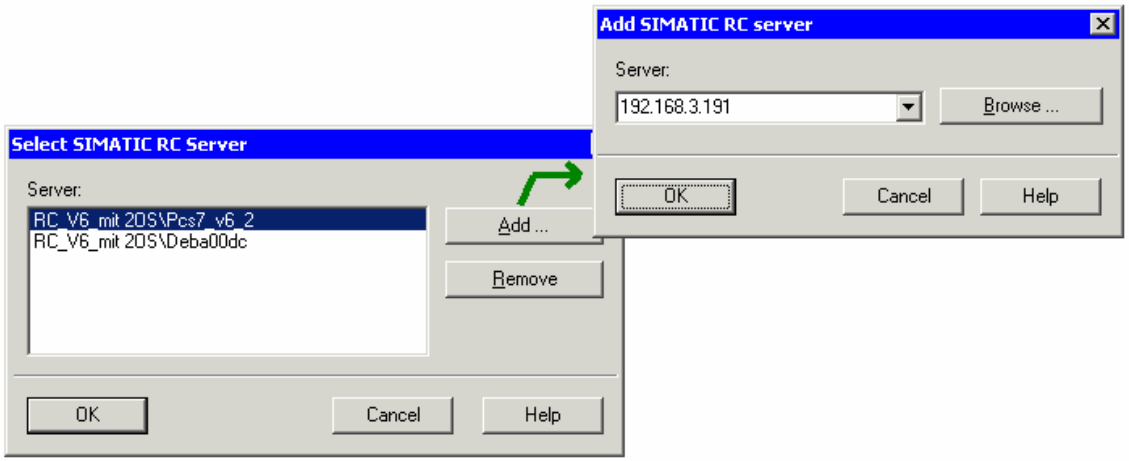
- For information on "browsing" the network for the computer name, refer to Route Control Center: Find Server

A.24.1.3 Route Control Center: Adding a Server

Note

If you have configured the station on which a Route Control Center is running as an RC application client" in HW Config and downloaded this configuration from the SIMATIC Manager to the client station, you no longer have to select the Route Control server in the following dialogs.

If a Route Control server has been selected before, and you reopen the selection dialog using "Program/Select Server," the previously known servers are offered. You can expand the list with "Add," or shorten the list by selecting a server and pressing "Remove."

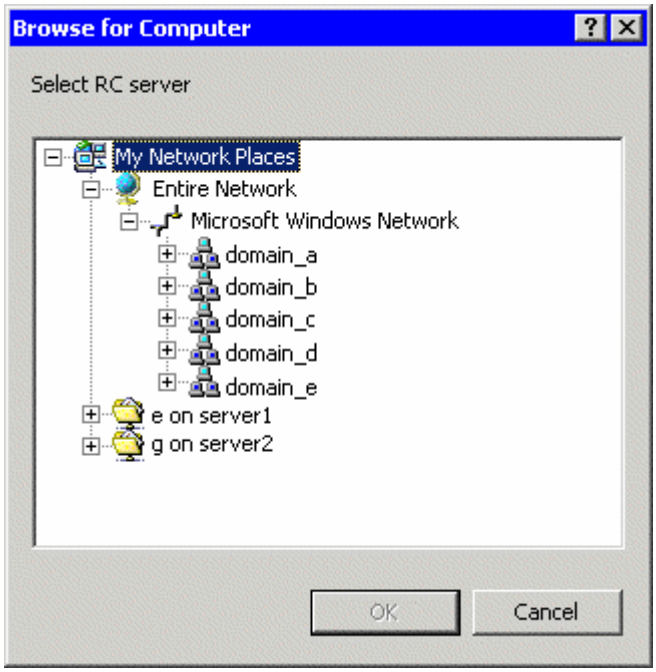


A.24.1.4 Route Control Center: Find Server

Note

If you have configured the station on which a Route Control Center is running as an "RC application client" in HW Config and downloaded this configuration from the SIMATIC Manager to the client station, you no longer have to select the Route Control server in the following dialogs

You can also use the Browse ... button to select a computer in your network.



A.25 Menu and Statusbar / Toolbar

A.25.1 Route Control Center: Menu

Menu Item	Sub-item	Meaning
Program	Server selection	Opens a dialog box for selection of the Route Control server to which the Route Control Center is to be connected. See Route Control Center: Adding a Server
	Log on	Opens a dialog box for a user to log on. Access to this function is not available when a user is logged on. See Route Control Center: Logon
	Log off	Opens a dialog box for a user to log off and log on again. Access to this function is only available if a user is logged on. See Route Control Center: Logon
	Close	Closes the Route Control Center application. The user will not be logged off unless Route Control Center is the last application still connected to the SIMATIC logon.
Mode	Manual	Switches from manual to automatic mode for the selected route, and vice versa
	Set route request	Initiates a route request (STARTING)
	Set route start	Starts the route; no mode levels will be activated at first (RUN)
	Set route hold	Places the route on hold (HOLD)
	Restart route	Allows a held route (with or without errors) to be restarted. If the route was in ERROR status, this error will also be acknowledged.
	Set route stop	Route is stopped (STOP)
	Route update	The list of elements and the route status will be updated; data will be downloaded from the Route Control server again for this purpose.
	Element update	The list of elements will be updated; data will be downloaded from the Route Control server again for this purpose.
	Route properties	Opens a dialog box containing the route properties. These properties can only be changed if the route is not running (IDLE) See Route Control Center: Route Properties
	Apply Material	See Route Control Center: General Operator Control Elements.
View	Element list	The lower area of the Route Control Center switches to the "Elements" view, that is, the "Elements" and "Modes" tabs are displayed.
	Request Details	The lower area of the Route Control Center switches to the view showing the result of a route request. Locked elements Locked partial routes Inconsistent commands Material error See also Route Control Center: Error during Route Request

Menu Item	Sub-item	Meaning
	Toolbar	Displays or hides the toolbar
	Status bar	Displays or hides the status bar
	Always on top	The Route Control Center will always be displayed on top and cannot be sent to the background even when the user switches to another application or window.
	Server status	Opens the dialog box containing the display of the Route Control server status.
	Reload	Reloads the data for the display from the Route Control server and reconfigures the view.
	Maintenance on/off	The maintenance view for the AS is displayed / hidden, see AS in Maintenance.
Options	Settings	See Route Control Center: Options/Settings
Help	Contents	Opens Help
	Context-Sensitive Help F1	Opens Help and jumps to the relevant description for the active dialog.
	Introduction	Opens Help and jumps to the introduction
	Getting Started	Opens Help and jumps to the description for getting started.
	Using Help	Opens Help and jumps to the description of how to find additional information using Help.
	About	Opens a dialog box containing information on the product name and version, copyright, company, etc.

A.25.2 Route Control Center: General Operator Control Elements

Element	Meaning
	The Route Control Center can be docked to its position; it will not be closed or sent to the background when a change is made to another application.
	Open the dialog box for selecting a Route Control server. For example, this enables another Route Control server on a multiclient to be selected.
	Open the dialog box displaying the status of the Route Control server.
	Update view. The data for the display are explicitly downloaded from the server again.
	Switch over the route to *manual* mode If element appears pressed, Switch over the route to *automatic* mode
	In manual mode only: Request route
	In manual mode only: Start route, mode levels will not yet be activated!
	In manual mode only: Interrupt route; mode levels will be deactivated, the route itself remains activated and the route lists are downloaded, and elements will not be enabled.
	In manual mode only: Finish route; mode levels will be deactivated, and elements of the route list are enabled.
	Acknowledge errors and continue executing the route (RESUME, HELD → RUN)
	As of V6.1, material can be set to a route if the route is already active. The specification of the material is made in two steps: 1. Specification of the material – see Route Control Center: Route Properties 2. Application of the material (this operator button) Note: This operator button is only activated when at least one linking element of the route differs from the specified material of the route.
	Display maintenance view of the RC Center (pressed) Display route overview of the RC Center (not pressed)

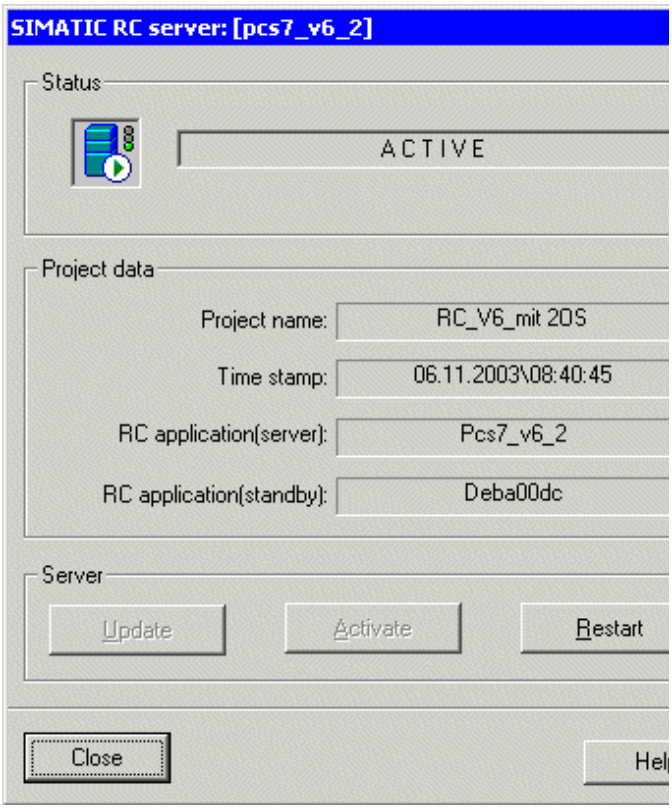
Note

See also RC Block Icon and Faceplate

A.25.3 Route Control Center: Server Status

Selecting the *View* > *Server Status* menu command opens a dialog box that displays the status of the Route Control server to which the Route Control Center is connected.

See also RC Server: User Interface Dialog



Current server status:

See Route Control Server Status

Information from the Route Control project:

1. Name of project
2. Name of server computer
3. Name of standby computer

With appropriate authorization (RC_OPERATOR_L3), you can perform operator inputs for the server.

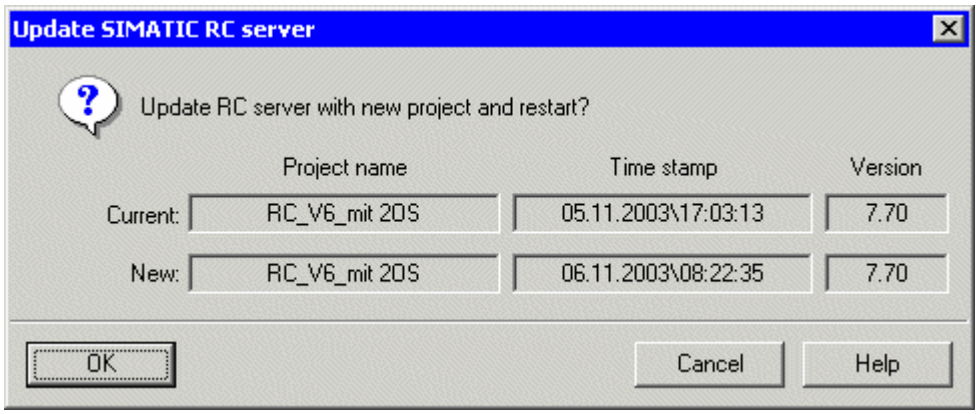
See table below.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Reload	A modified Route Control project engineering that was previously copied to the server is copied to the active area of the server and activated after confirmation of a restart. See also Updating the Route Control Server
Activate	This operator input is only available if the server is currently running in standby mode. When activated, the standby computer becomes the master.
Restart	The Route Control server will be shut down; the project engineering is then reread and a general request is executed again. Telegram processing is then enabled again.

A.25.4 Updating the Route Control Server

Dialog



Meaning

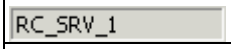
Element	Meaning
Current:	Displays the Route Control project (name and time stamp) that is currently active in the server (that is, the Route Control project that was most recently loaded). In addition, the version number of the project is indicated. The version number only changes when structural changes are made to the project engineering database and is modified only through installation of a new Route Control version. (This also explains why the conversion tool is then automatically called.) Thus, in this case, the version number is neither consecutive nor can it be manipulated by the user.
New:	The Route Control engineering tool has been used to load a new project engineering database onto the server, but the database is not yet enabled. The name and time stamp of the new project engineering is also displayed here.
OK	Clicking OK updates the project engineering. That is, the old project engineering is replaced by the new one. The changeover cannot be undone at this point.
Cancel	This cancels the operation to update the project engineering on the server. The new project engineering is not loaded.
Help	Jumps to the relevant description in the online Help

A.25.5 Route Control Center: Options/Settings

For the second tab, refer to Route Control Center: Activation Keys

Parameter	Range of Values	Meaning
Time until a tooltip appears	10 to 1000	Time, in milliseconds, that the mouse must be pointed to a location, such as the toolbar, before a note in the form of tooltip is displayed.
Duration that tooltip, remains visible	10 to 5000	Duration, in milliseconds, that the note is visible
Route View	Yes/No	Yes: If more than one route is displayed in the upper part of the Route Control Center, they are sorted according to ID No: No sorting
Element View	Yes/No	Yes: If more than one element is displayed in the lower part of the Route Control Center, they are sorted according to ID No: No sorting
Mode View	Yes/No	Yes: If more than one element is displayed in the lower part of the Route Control Center, they are shown sorted according to mode level. No: No sorting
Respond to position limiting	Yes/No	Respond to position limiting: Yes: The working area of WinCC restricts the position of the Route Control Center; it cannot be moved beyond the working area. No: The Route Control Center can be positioned freely

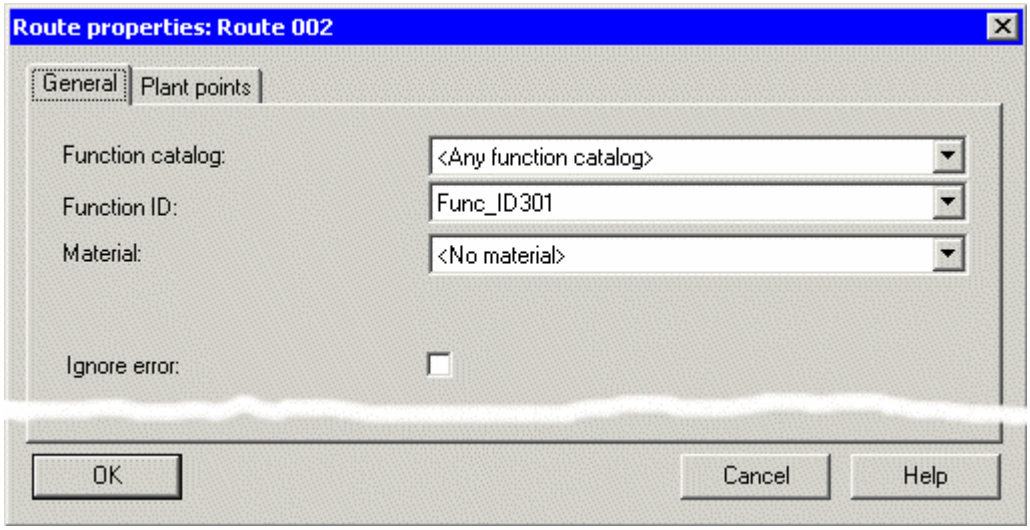
A.25.6 Route Control Center: Status Bar

Element	Meaning
	Sum symbol: sum of ongoing material transport (routes). Status of Route Control server connected to the Route Control Center. For possible statuses of the Route Control server, refer to Route Control Server Status
	Name of the Route Control server computer
	Name of user who is currently logged on to this computer. If no user is logged on, "[unknown]" is displayed. Double-clicking the name opens the logon dialog, and, if necessary, another user can log on once the previous user has logged off.
	If the SIMATIC logon component is not installed, this is indicated in the Route Control Center (as in the RC engineering tool and RC server) by a small red "x" on the user symbol.

A.26 Route Properties

A.26.1 Route Control Center: Route Properties

Selecting the *Control* > *Route Properties* menu command opens a dialog box where the properties of a route can be changed, provided the route is inactive:



Here you can assign parameters that are taken into account the next time the route is requested:

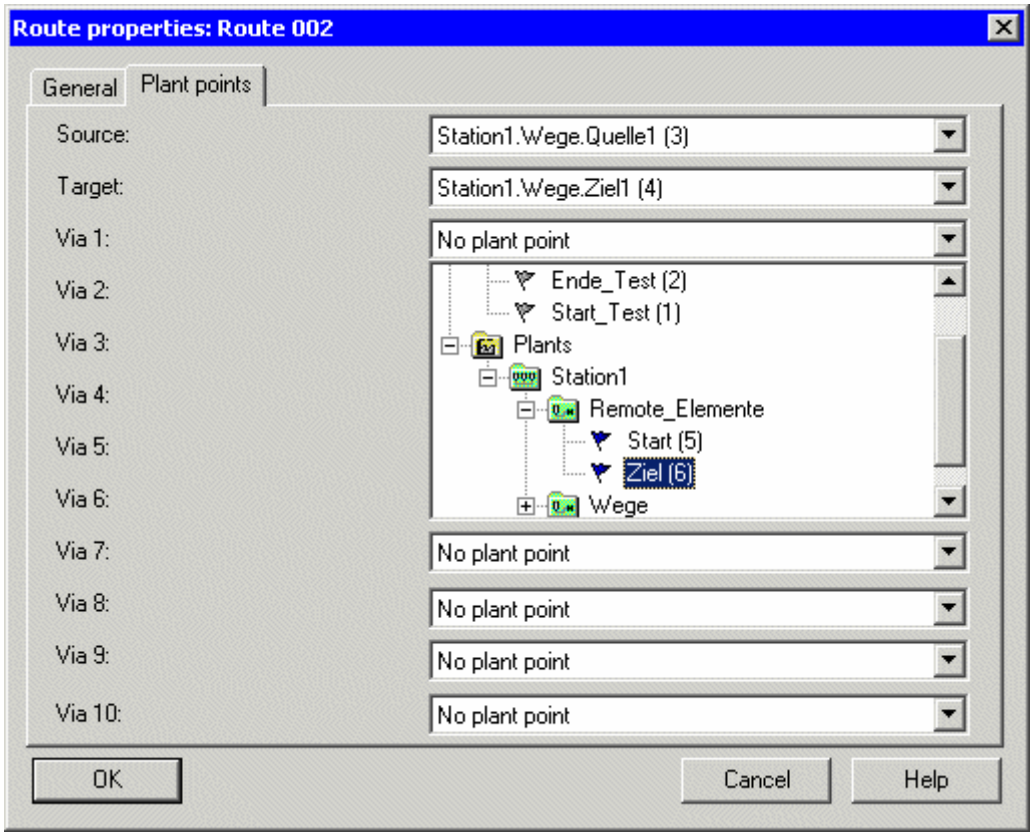
- Mode table
- Function ID (FUNC_ID)
- The material (as of V6.1, material can be set to a route if the route is already active),
  see also: Route Control Center: General Operator Control Elements.
- For a description of ignoring an error, refer to the IGN_ERR parameter in RC_IF_ROUTE (FB800)

... For more information on the "Locations" tab, refer to → Route Control Center: Locations

A.26.2 Route Control Center: Locations

The route locations can be selected on the second tab:

- Source location
- Destination location
- Transition point 1 to 10



The meaning of the small flags is as follows:

- This location has been configured as "not selectable for..."
- This location can be selected

See also Locations (Properties Dialog).

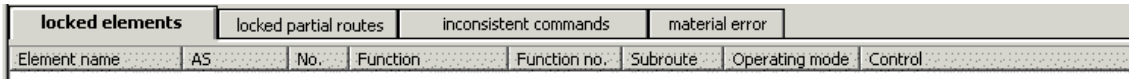
A.26.3 Route Control Center: Error during Route Request

Errors occurring during a route request are displayed in detail:

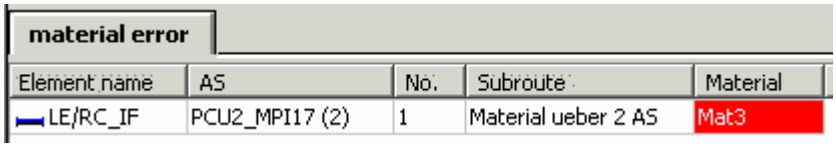
- Locked elements
- Locked partial routes
- Inconsistent commands
- Material error

The Route Control Center switches automatically to this view if an error occurs when a route is requested.

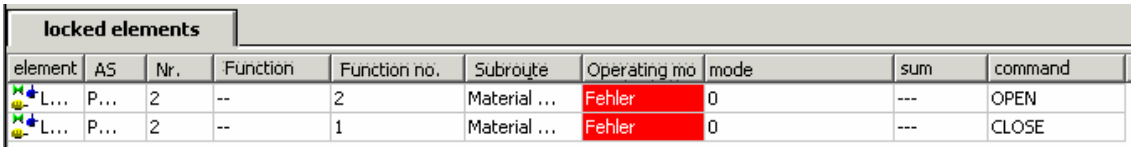
It is possible to display all four tabs at once:



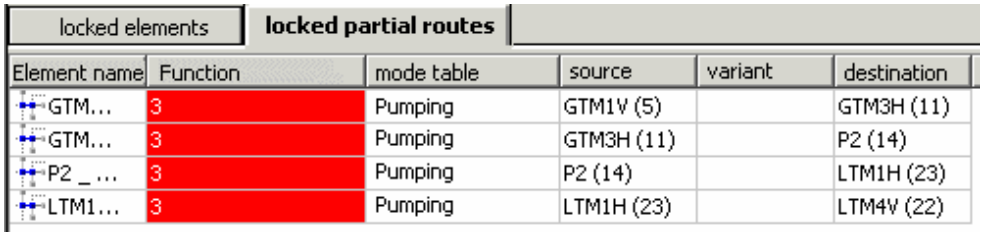
This view is restricted to the cause of the error during a route request, for example, if a material error occurred (succeeding material not permitted)



for example, if an element error occurred (locked element)



for example, if a partial route error occurred (locked partial route)



A.27 Interface

A.27.1 Route Control Center: Route Overview

Column	Meaning
Route	The route ID used for this route is displayed.
Master AS	The automation system that controls this route (that is, the AS in which the RC_IF_ROUTE will be activated from the user program).
Function ID	When there are multiple routes, the function ID is normally different so that elements assigned by a route cannot be used for another route (exclusive access). In certain cases, multiple routes share elements and use the same function ID. In the route overview, all routes with the same function ID are displayed even if they use different route IDs. This enables the operator to easily switch to the element lists of other routes, as they can also influence the behavior of the operator's own route (commands).
Mode table	The mode table used to execute this route was specified by the user program in the RC_IF_ROUTE.
Material	If used, the material that will be transported with this route is displayed here.
Step	Batch recipe step that activates this route. The name will be specified by the user program for RC_IF_ROUTE.
Batch name	Name of batch that activates this route. The name will be specified by the user program for RC_IF_ROUTE.
Source	Source location for material transport
Destination	Destination location for material transport
Status	Status of route

Color	Meaning
	See also RC Faceplate (Display and Operator Control Elements) - 2/4
White	Route is inactive or idle; material transport is not taking place with this route.
Yellow	The route (that is, the list of elements for this route) is being requested, the automation systems are waiting for the route list, and the Route Control server is searching for a suitable path containing the specified locations and parameters. The route list has been downloaded to the AS, and the route is ready to start (ready for RUN signal).
Green	The route is running. Mode levels can be activated or deactivated.
Red	Route is faulty; one of the monitoring times has expired and at least one of the elements has not reached its set position, so the mode level has not been achieved.

Icon	Icon	Meaning
Automatic mode	Manual mode	
		Route is idle; this route ID or route will not be used. This ID must first be assigned to an instance using dynamic ID assignment.
		Route is idle; route ID is assigned to an instance.
		Route request is in progress, or route list is available in the automation systems involved and the route is waiting for a RUN signal. State = STARTING
		Route is running (RUN)
		Route has been interrupted (HELD)
		Route is faulty (ERROR)

A.27.2 Route Control Center: Elements

Column	Meaning
Name	Name of element
AS	Name of automation system controlling this route (master AS)
No.	Number of element corresponding to the AS (1 to 1,024)
Mode	Name of mode level in which this element has been inserted and will be activated
Mode No.	Number of mode level (1 to 32)
Partial route	Name of partial route in which the element is inserted
Operating mode	Automatic or manual
Feedback	Current feedback value (actual value) for the element
Command	Current command value (setpoint) for the element

An exclamation point (!) after the expected feedback means:

This element will be activated and the routing system will wait for this feedback.

A question mark (?) behind the expected feedback means:

This element will only be asked whether it is supplying this feedback.

A.27.3 Route Control Center: Sorting

The shortcut menu can be used to change the sorting of the display (mouse pointer must be on one of the column headers). Possible sorting criteria are:

Category	Sorting Criterion	'Modes' Tab	'Elements' Tab
Element	Name of element	X	X
	Number of automation system containing this element	X	X
	Element subtype, such as MOTOR, VALVE as subtypes of a control element	X	X
	Element type, such as control, sensor, linking, or parameter element	X	X
	Active elements	---	X
	Passive elements	---	X
	Faulty elements	X	X
Mode	Name	---	X
	Number	---	X
	State	---	X
Partial route	---	---	X

X = Sorting is available

--- = Sorting is not available

A.27.4 Route Control Center: Activation Keys

The manner in which an element is used in a mode level (activated versus passively requested) is represented using certain abbreviations. These abbreviations can be changed by entering a new abbreviation in the corresponding column.

Act.	Deact.	Check	PC	DT ON	DT OFF	Idle state Off	**Abbrev.**
X							a
	X						d
X		X					a?
	X	X					d?
X			X				p
X				X			d1
X					X		d2
X				X	X		d3
X			X	X			pd1
X			X		X		pd2
X			X	X	X		pd3
						X	-

Icon	**Meaning**
a	This element will be activated in this mode level
d	This element will be deactivated in this mode level
a?	This element will be activated in this mode level, and its actual position will be requested (checked)
d?	This element will be deactivated in this mode level, and its actual position will be requested (checked)
p	This element will be activated in this mode level in pulse mode.
d1	This element will be activated in this mode level with a switch-on delay time > 0
d2	This element will be activated in this mode level with a switch-off delay time > 0
d3	This element will be activated in this mode level with a switch-on and switch-off delay time > 0
pd1	Same as d1, but with pulse time
pd2	Same as d2, but with pulse time
pd3	Same as d3, but with pulse time
-	The idle state position will also be monitored When the mode level is deactivated, monitoring will be performed to determine whether the element is also switched off (motor) or closed (valve).

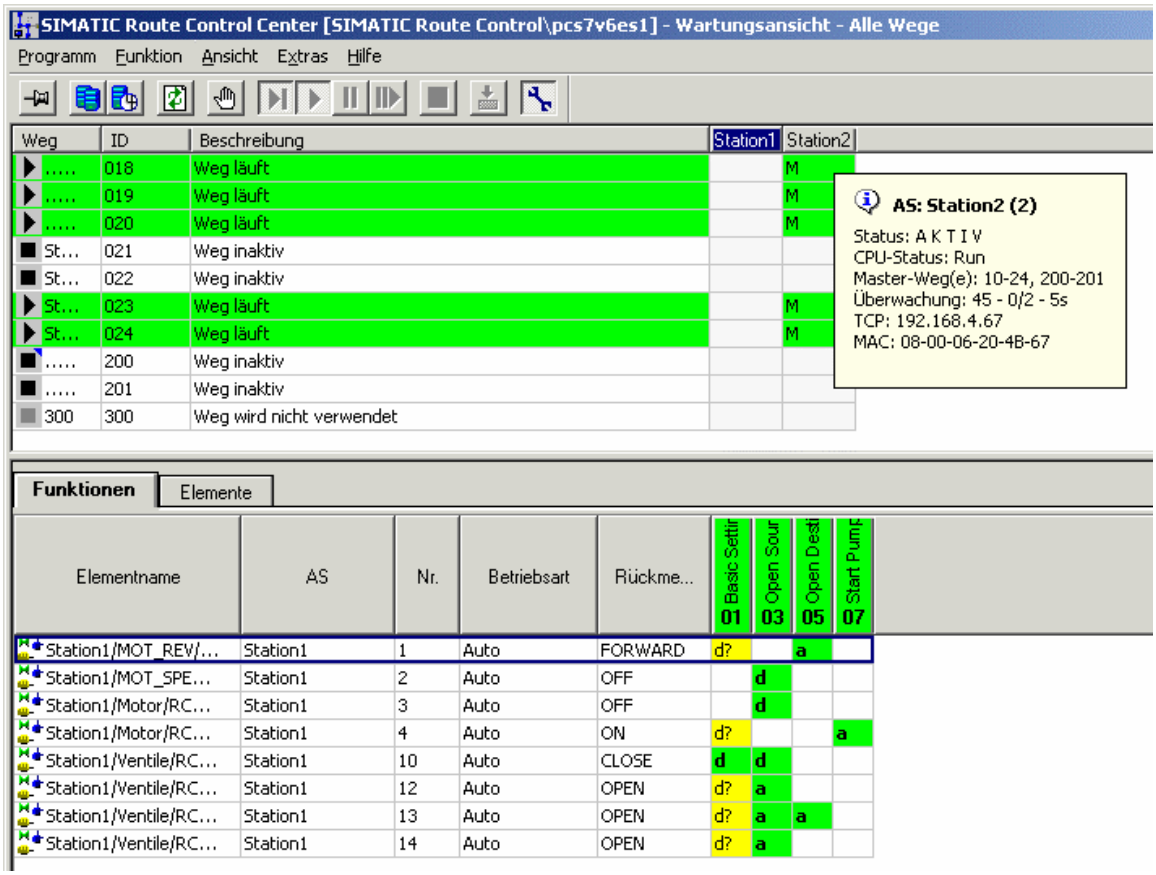
A.27.5 Route Control Center: Modes

Column	Meaning
Element	Name of element
AS	Name of automation system controlling this route (master AS)
No.	Number of element corresponding to the AS (1 to 1,024)
Operating mode	Auto = Route is activated automatically, that is, by the user program in the AS Manual = Route is activated manually by the user, that is, by means of the faceplate or the Route Control Center
Feedback	Current feedback for element
01 Mode level 1*	Blank: This element will not be used in this mode level For a description of abbreviations, see below.
...	- " -
32 Mode level 32*	- " -

Note

* The number of mode levels and the names of the mode levels depend on the Route Control project engineering. The mode levels displayed are limited to those containing elements present in this route.

A.27.6 Route Control Center: Maintenance View



Column	Meaning
Route	Name of the route
ID	Resource ID (route ID) used by the route. This ID can change when dynamic route ID assignment is used.
Description	Current status of the route
AS...	M = This AS controls the route as master S = This AS participates in the route as a slave The colors mean White = Route is inactive Yellow = Route request in progress Green = Route is active Red = Route is in error state
AS... !	If an exclamation point (!) is displayed after the name of the AS, this indicates that the AS is in the "Maintenance" state for Route Control. The AS cannot be used for controlling material transport in this state neither as a master (controller) nor slave (passive participation) AS. The entire column is displayed in red in the "Maintenance" state.
AS... (H)	If an H is displayed after the name of the AS, this indicates that it is an H-machine (CPU 417-4H) in contrast to a non-H-machine such as 417-4.

A.28 Route Control Interfaces

A.28.1 CSV Export / Import

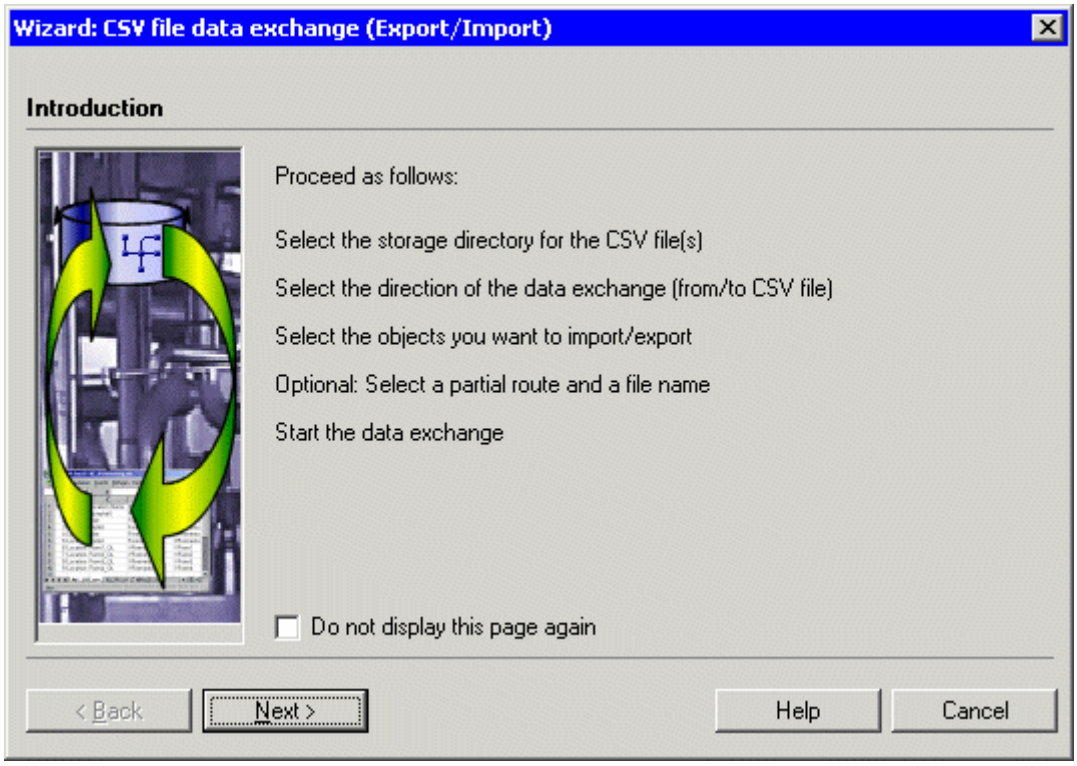
A.28.1.1 Interfaces: CSV File (Overview)

Use of this interface can simplify and speed up your project engineering. The main objects of the Route Control project engineering can be exported to a text file (CSV file, columns separated by commas) and reimported from this text file.

The dialogs below indicate the individual steps required to perform this data exchange.

A.28.1.2 Interfaces: CSV File (Introduction)

Dialog



Description

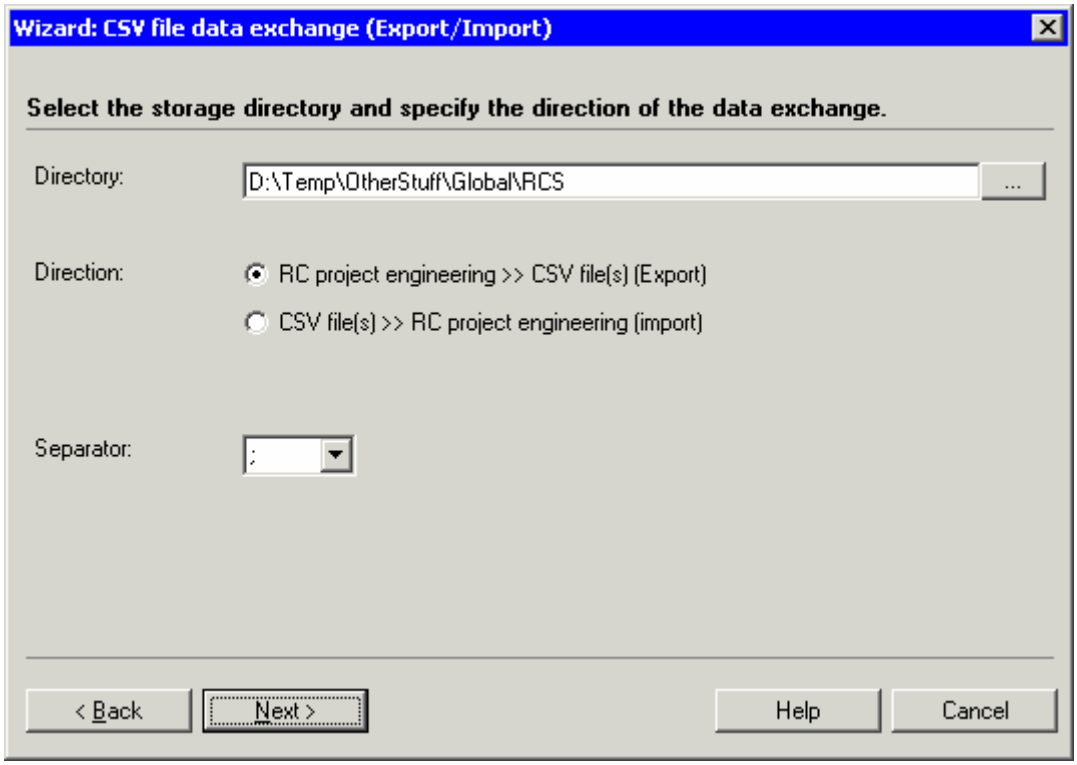
This dialog provides an overview of the individual steps to be performed. This dialog can be disabled so that it will no longer appear, even if the CSV wizard is called again. If you then wish to call up this dialog again, select **Options > Settings > Activate System Messages** in the Route Control engineering tool.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Do not...this page	☐ This dialog will always be displayed upon subsequent calls ☑ This dialog will no longer be displayed upon subsequent calls
Next	This brings you to the next dialog
Cancel	The wizard will be canceled. No changes will be made to the data, and no data will be imported or exported.
Help	Jump to online Help

A.28.1.3 Interfaces: CSV File (Global Settings)

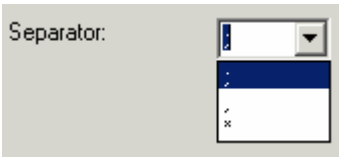
Dialog



Description

You set global information applicable to all projects in this dialog.

- Directory in which the CSV files or the CSV files to be imported are to be stored. The directory in which the Route Control project engineering database is located is preset, but this directory can be changed if necessary.
- The direction for the data exchange: Export = from Route Control project engineering to CSV file(s). Import = From CSV file(s) to Route Control project engineering.
- Separators to be used as marker to distinguish between columns in the CSV file. Semicolon, comma, and asterisk can be used as separators.

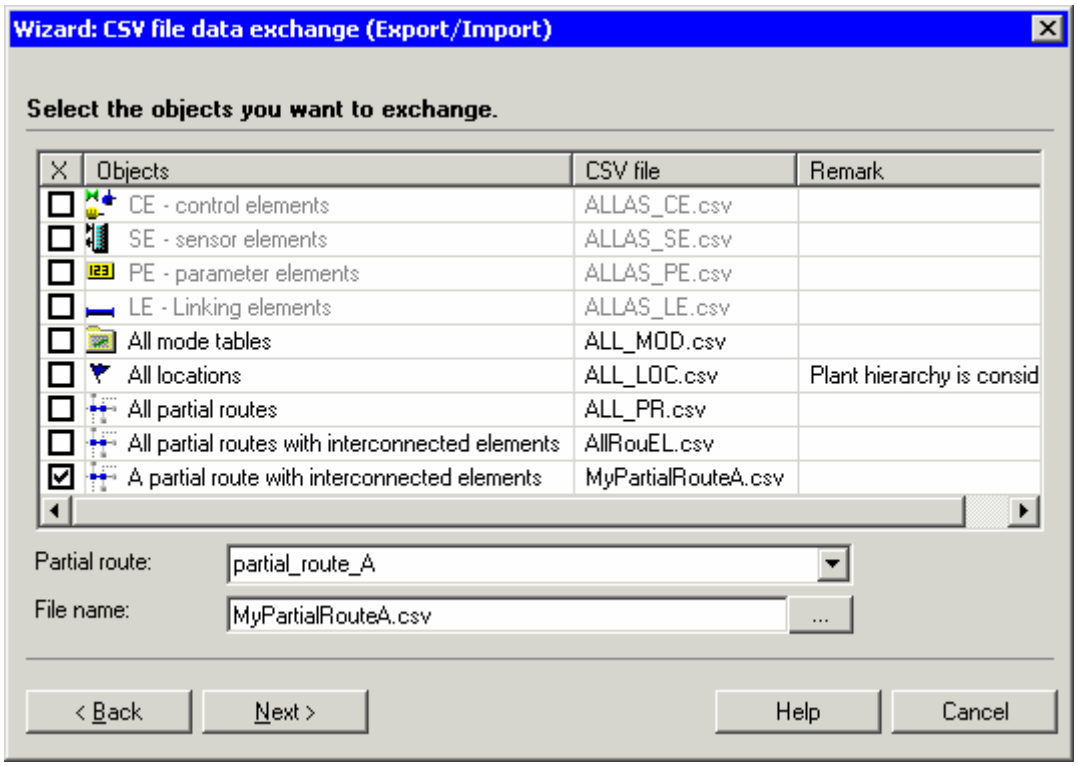


Meaning of Operator Control Elements

Operator Control Element	Meaning
Back	This takes you to the previous dialog
Next	This brings you to the next dialog
Cancel	The wizard will be canceled. No changes will be made to the data, and no data will be imported or exported.
Help	Jump to online Help

A.28.1.4 Interfaces: CSV File (Object Selection)

Dialog



Description

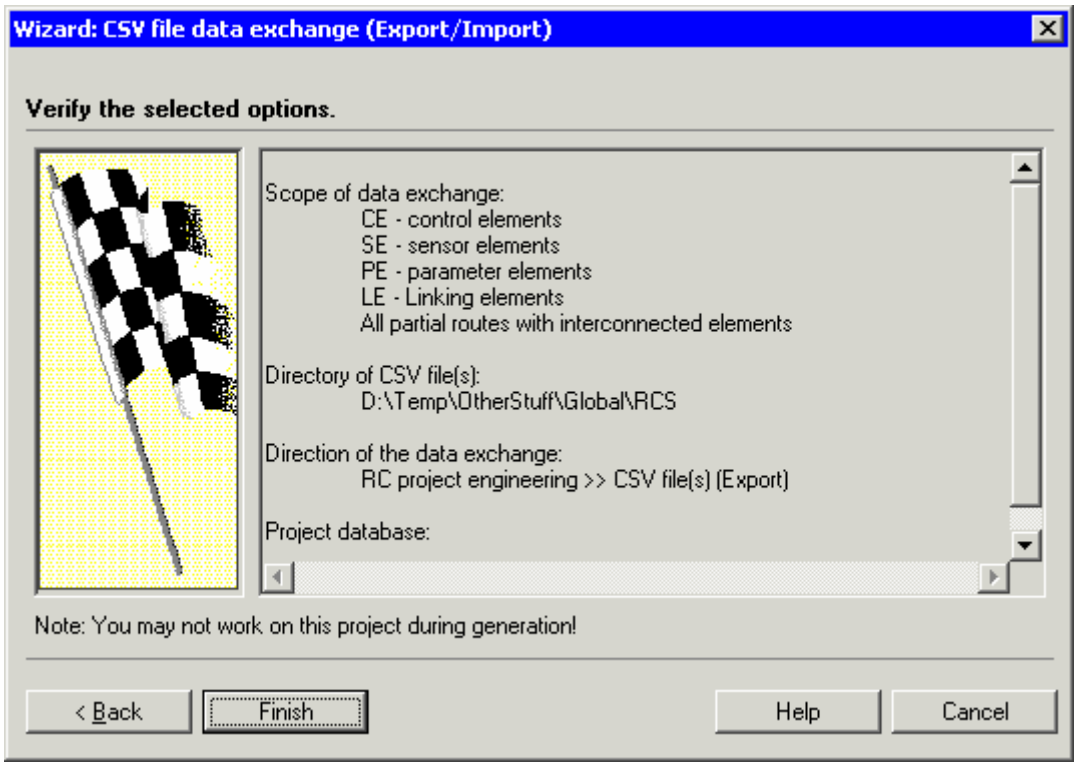
You select the objects to be exchanged in this dialog. If you select the bottom entry ('One partial route with interconnected elements'), you must select a configured partial route from the list and specify a file name (with a *.CSV extension).

Meaning of Operator Control Elements

Operator Control Element	Meaning
...	Here you can select an existing CSV file
Back	This takes you to the previous dialog
Next	This brings you to the next dialog
Cancel	The wizard will be canceled. No changes will be made to the data, and no data will be imported or exported.
Help	Jump to online Help

A.28.1.5 Interfaces: CSV File (Summary)

Dialog



Description

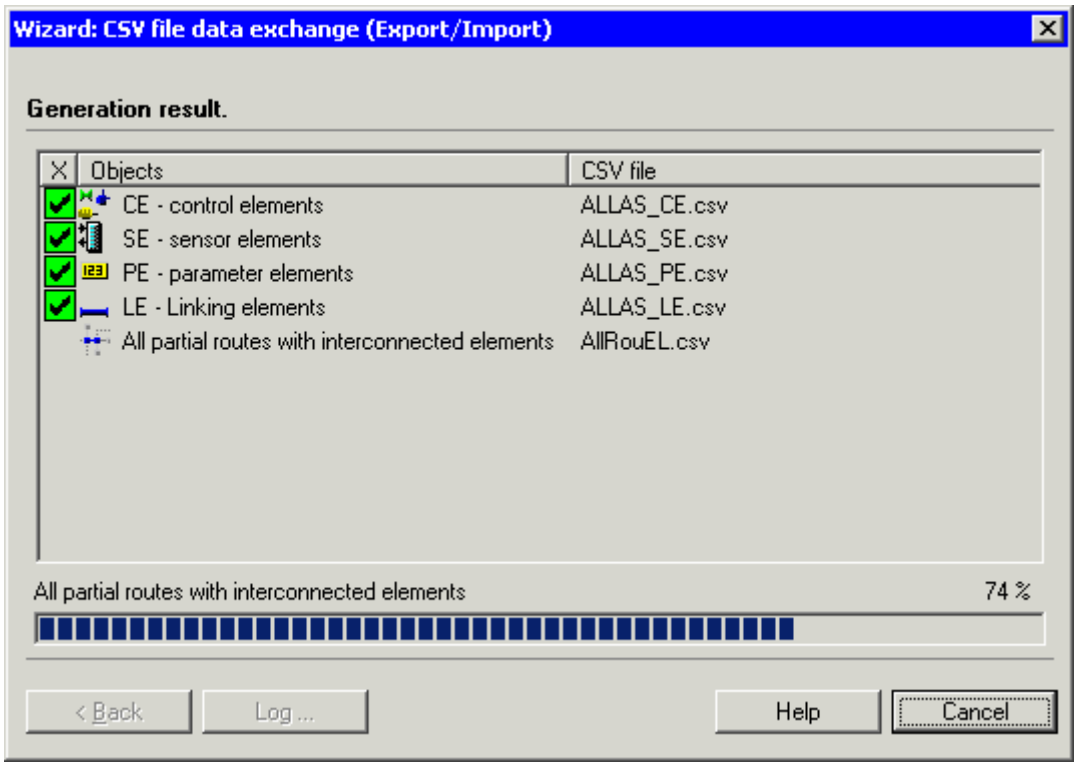
This dialog provides an additional summary of the actions that will be performed when the "Finish" button is activated.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Back	This takes you to the previous dialog
Finish	Starts the export or import
Cancel	The wizard will be canceled. No changes will be made to the data, and no data will be imported or exported.
Help	Jump to online Help

A.28.1.6 Interfaces: CSV File (Progress Dialog)

Dialog



Description

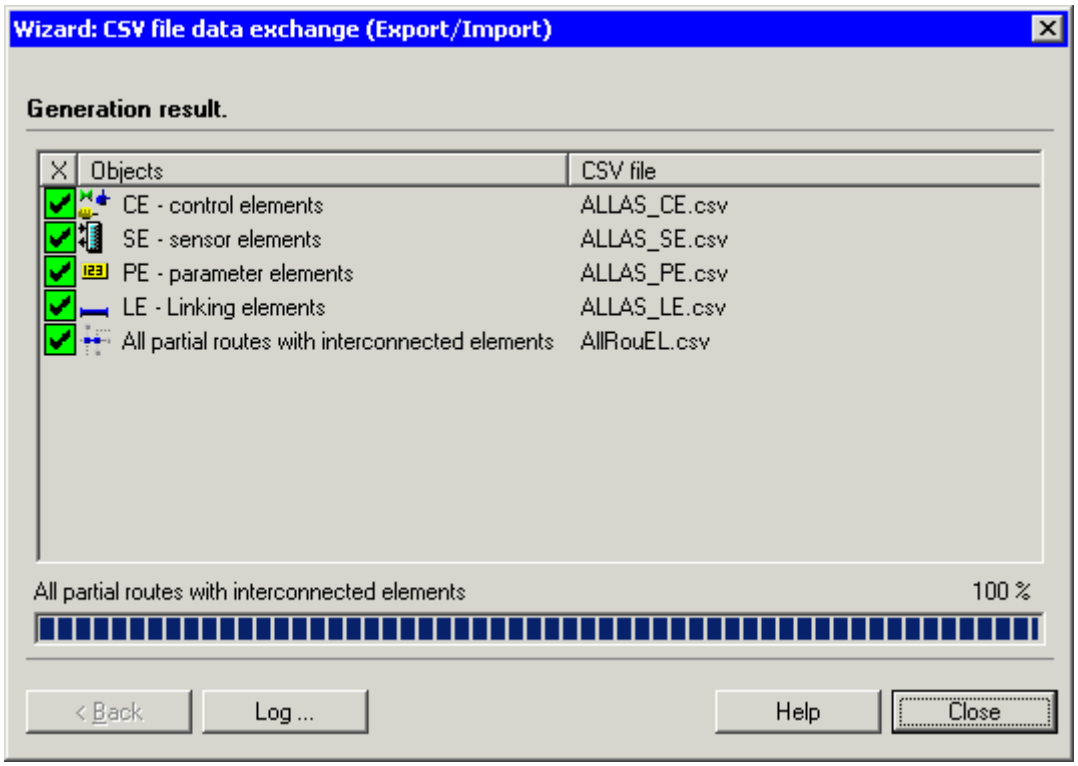
While the export or import operation is taking place, this dialog is displayed to show you the progress and result for each step.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Next	This brings you to the next dialog
Cancel	The wizard will be canceled. No changes will be made to the data, and no data will be imported or exported.
Help	Jump to online Help

A.28.1.7 Interfaces: CSV File (Result)

Dialog



Description

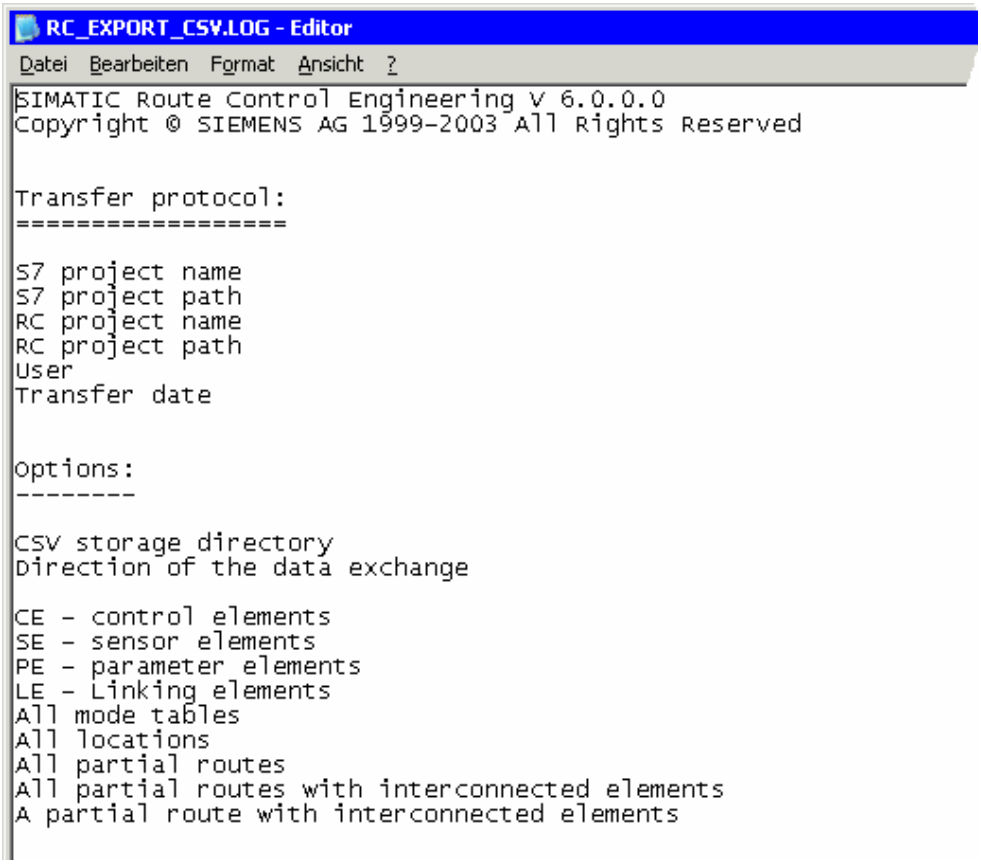
Once all of the steps have been performed, a summary is displayed to show you the results of the individual steps.

Meaning of Operator Control Elements

Operator Control Element	Meaning
Results list	The export/import operation was completed correctly; no error occurred. An error occurred in at least one element; the remaining elements were able to be imported/exported. A serious error occurred (for example, a CSV file could not be opened or an internal software error occurred).
Next	This brings you to the next dialog
Cancel	The wizard will be canceled. No changes will be made to the data, and no data will be imported or exported.
Help	Jump to online Help

A.28.1.8 Interfaces: CSV File (Log File)

Dialog



Description

This log summarizes all of the settings and results of the individual steps. If an error occurs, you can consult this log to identify the cause of the error. The RC_EXPORT_LOG.TXT or RC_IMPORT_LOG.TXT file is always located in the same directory where the CSV files are stored.

Meaning of Operator Control Elements

There are no operator control elements.

A.28.1.9 Interfaces: CSV File (Structure)

The CSV files must be set up according to a certain scheme and satisfy specified conventions. You should not have to reconfigure elements transferred from an S7 project by means of a CSV file.

Control Elements (ALLAS_CE.CSV)

Column	Min.	Max.	Meaning
Table	CE	---	Specified table name in the Route Control project engineering database; this name must not be changed!
Automation system	1 character	24 characters	Name of AS
Element name	1 character	64 characters	Name of control element
Number	1	1.024	Element ID that is unique from all others in this AS
Type	MOTOR VALVE MOT_VAL MOT_SPED MOT_REV	---	Type of control element in plain text. User-defined types are also permitted here, but these must have already been transferred from an S7 project to the Route Control project engineering (prior to the CSV import).
Ignore error	0	1	0: Feedback error of a control element does *not* result in a mode level error 1: Feedback error of a control element results in a mode level error (= former *ignore error bit*)
Comments	0 characters	50 characters	Comment field in the control element properties

Sensor Elements (ALLAS_SE.CSV)

Column	Min.	Max.	Meaning
Table	SE	---	Specified table name in the Route Control project engineering database; this name must not be changed!
Automation system	1 character	24 characters	Name of AS
Element name	1 character	64 characters	Name of sensor element
Number	1	1.024	Element ID that is unique from all others in this AS
Type	CONDUC TIVITY SENSOR		Type of sensor element in plain text. User-defined types are also permitted here, but these must have already been transferred from an S7 project to the Route Control project engineering (prior to the CSV import).
Comments	0 characters	200 characters	Comment field in the sensor element properties

Parameter Elements (ALLAS_PE.CSV)

Column	Min.	Max.	Meaning
Table	PE	---	Specified table name in the Route Control project engineering database; this name must not be changed!
Automation system	1 character	24 characters	Name of AS
Element name	1 character	64 characters	Name of parameter element
Number	1	1.024	Element ID that is unique from all others in this AS
Type	TIMER VOLUME	---	Type of parameter element in plain text. User-defined types are also permitted here, but these must have already been transferred from an S7 project to the Route Control project engineering (prior to the CSV import).
External	0	1	0: Internal parameter element. Value will be configured. 1: External parameter element; value will be transferred in RC_IF_ROUTE during runtime.
Comments	0 characters	200 characters	Comment field in the sensor element properties

Linking Elements (ALLAS_LE.CSV)

Column	Min.	Max.	Meaning
Table	LE	---	Specified table name in the Route Control project engineering database; this name must not be changed!
Automation system	1 character	24 characters	Name of AS
Element name	1 character	64 characters	Name of linking element
Number	1	1.024	Element ID that is unique from all others in this AS
Comments	0 characters	50 characters	Comment field in the linking element properties

All Mode Tables (ALL_MOD.CSV)

Column	Min.	Max.	Meaning
Table	Mode	---	Specified table name in the Route Control project engineering database; this name must not be changed!
Mode table	1 character	24 characters	Specified table name in the Route Control project engineering database; this name must not be changed!
Mode table comments	0 characters	50 characters	Optional: Comments on a mode table
Number	1	32	Number of mode level
Mode level	1 character	24 characters	Name of mode level
Mode level comment	0 characters	50 characters	Optional: Comments on a mode level

All Locations (ALL_LOC.CSV)

Column	Min.	Max.	Meaning
Table	Location	---	Specified table name in the Route Control project engineering database; this name must not be changed!
Location ID	1	64.000	Location number that is unique from all others
Process cell	0 characters	24 characters	Name of unit; if a unit is not specified, the process cell name will be ignored.
Portion of a plant	0 characters	24 characters	Name of unit; if a process cell name is not specified, the unit name will be ignored.
Location	1 character	24 characters	Name of plant-related location or general location
bSource	0	1	0: Location can *not* be used as a source for partial routes 1: Location can be used as a source for partial routes
bVia	0	1	0: Location can *not* be used as a "via" location for partial routes 1: Location can be used as a "via" location for partial routes
bDestination	0	1	0: Location can *not* be used as a destination for partial routes 1: Location can be used as a destination for partial routes
bVariant	0	1	0: Location can *not* be used as a variant for partial routes 1: Location can be used as a variant for partial routes Variants are fictitious intermediate locations that are used to define the path of a partial route more precisely.

Column	Min.	Max.	Meaning
Comments	0 characters	100 characters	Comments on this location or general location

All Partial Routes (ALL_PR.CSV)

Column	Min.	Max.	Meaning
Table	Partial route	---	Specified table name in the Route Control project engineering database; this name must not be changed!
Partial route	1 character	48 characters	Name of partial route
Mode table	1 character	24 characters	Name of mode table to which this partial route is assigned
Source	1 character	24 characters	Name of source location for this partial route. The source must be specified!
Destination	1 character	24 characters	Name of destination location for this partial route. The destination must be specified!
Via	0 characters	24 characters	Name of Via location for this partial route. The destination can be specified optionally!
Prio	1	32.000	Priority of this partial route Default value = 1
Bi-directional	0	1	0: The route is unidirectional, that is, it can only run from the source to the destination (important for route search during runtime) 1: The route is bi-directional, that is, it can run in both directions. This means that paths can also be found in the opposite direction of the partial route (from destination to source). Default value = 0
Comments	0 characters	100	Comments on this partial route

All Partial Routes with Interconnected Elements (ALLRouEL.CSV)

Column	Min.	Max.	Meaning
Table	Route_CE Route_LE Route_PE Route_SE	---	Name of table where these data are stored. The correct table corresponding to the element type must be entered here.
Mode table	1 character	24 characters	Name of mode table to which this partial route is assigned
Partial route	1 character	48 characters	Name of partial route in which the element is inserted
Automation system	1 character	24 characters	Name of automation system where the element is located
Element name	1 character	64 characters	Name of element

Column	Min.	Max.	Meaning
Mode level	1 character	24 characters	Name of mode level in which this element is inserted in this partial route or in which the element will be activated.
Command	1 character	24 characters	Name of command, for example, ON or OFF for a MOTOR. Text depends on the activation commands configured for an element type
bPassive use	0	1	0: Element is only passively requested for an expected feedback 1: Element will be activated with a setpoint
bMonitor idle state	0	1	0: Only the activated state, and not the idle state, of an element will be monitored. 1: The idle state of an element will also be monitored. An element is in idle state when a mode level in which the element has inserted in not activated.
PE value	-9999999999	99999999999	The number can contain up to 11 digits, including the sign and decimal point.
bSummation type	0	1	0: Interconnected parameter element is not a summation PE. 1: Interconnected parameter element is a summation PE. 0 or 1 is only relevant for a PE; this entry can be omitted for other types.
Pulse time On	0	255	Length of high signal when an element is activated.
Pulse time Off	0	255	Length of low signal when an element is activated.
Delay time On	0	255	Length of time delay after the mode level is activated until the element itself becomes activated.
Delay time Out	0	255	Length of time delay after the mode level is deactivated until the element itself becomes deactivated.
Sorting number	1	64.000	Consecutive sorting number. Numbers must be consecutive and unique from all other in the CSV file.

One Partial Route with Interconnected Elements (<name>.CSV)

Column	Min.	Max.	Meaning
This file has the same structure as ALLRouEL.CSV, see above.			

A.28.1.10 Interfaces: CSV File (Error Messages)

A number of errors can occur when objects are imported. For information on the permitted values for individual columns in the import files, refer to Interfaces: CSV File (Structure).

No.	Text	Remedy
1	Info: Updated	Element has been successfully updated in the database.
2	Error: Element length ('element...') exceeded	The character string of an element name is too long; the name must be shortened to the permissible length
3	Error: Element name ('element...') not defined	The element name is missing; a name must be specified
4	Error: AS ('AS <ID>') not found	You have specified an AS ID that does not exist in the Route Control project engineering
5	Error: Type ('...') not found	This element type is unknown. This usually involves a typographical error, such as MOTORS instead of MOTOR
6	Error: Number ('...') is not numerical	The 'Number' property for this element consists of numbers only. Alphabetic characters are not permitted.
7	Error: Name of mode table ('...') too long	The character string of a mode table is too long; it must be shortened to the permissible length
8	Error: Mode table ('...') is missing	The character string of a mode table is too short (characters are nonexistent). At least one character must be entered.
9	Error: Mode name ('...') not defined	Mode name is unknown
10	Error: Name of mode level ('...') too long	The character string of a mode level is too long; it must be shortened to the permissible length
11	Error: Number of mode level ('...') not numerical	The 'Number' property for this mode level consists of numbers only. Alphabetic characters are not permitted.
12	Error: Name of process cell ('...') too long	The character string of a process cell (Pcell) is too long; it must be shortened to the permissible length
13	Error: Name of unit ('...') too long	The character string of a unit is too long; it must be shortened to the permissible length
14	Error: ID of unit ('...') not defined	You have specified a unit ID that does not exist in the Route Control project engineering
15	Error: ID of location ('...') not numerical	The 'Number' property for this location consists of numbers only. Alphabetic characters are not permitted.
16	Error: Partial route ('...') is not defined	You have specified the name of a partial route that does not exist in the Route Control project engineering.
17	Error: Comments ('...') too long	The character string of a comment is too long; it must be shortened to the permissible length
18	Error: Value ('...') is not a logical value	The import wizard cannot recognize the value as a logical value; only 0 or 1 is permitted.

A.29 S7 Project Data Import

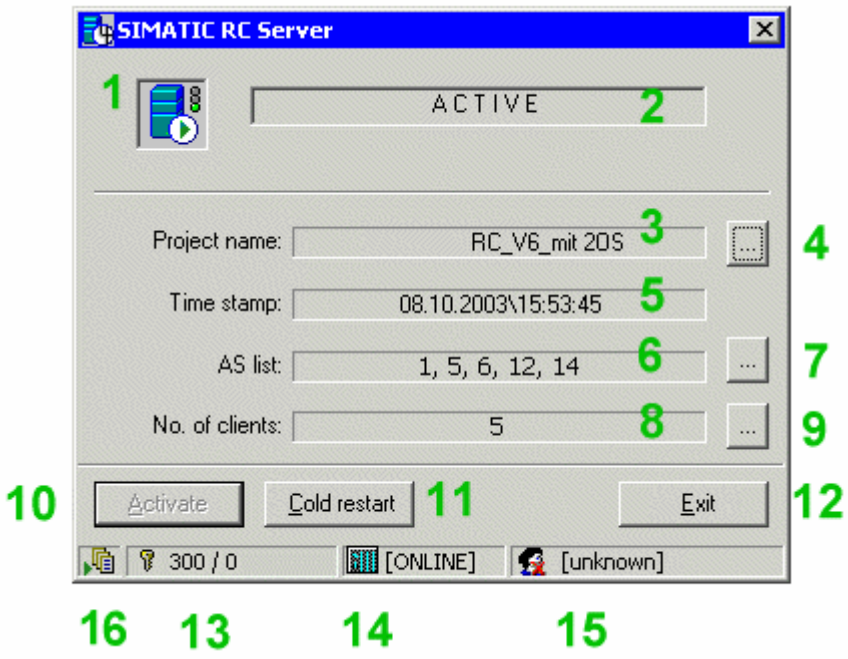
A.29.1 Interfaces: Importing S7 Project Data

See Transfer from S7 Project and Route Control Wizard: Import.

A.30 Route Control Server

A.30.1 RC Server: User Interface Dialog

This dialog provides information on the current state of the RC server:



1. Status of the Route Control server (for a description, see Route Control Server Status)
2. Status of the Route Control server in plain text
3. Project that is currently loaded (see Project Settings (Properties))
4. Displays the dialog showing the route information in the server.
   See RC Server: Expanded Diagnostics (Route List)
5. Time stamp and date and the Route Control project that is currently loaded.
6. List of automation systems that are connected to the RC server or to which an attempt was made to establish a connection. Automation systems in

parentheses () are currently not available, see RC Server: Expanded Diagnostics (AS List) and RC Server: Expanded Diagnostics (OS-AS Connections)

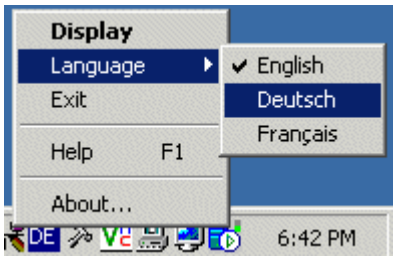
7. Displays the dialog showing the AS connections
8. Number of clients (RC Center) that are connected to the server
9. Opens the dialog showing the client connection.
   See RC Server: Expanded Diagnostics (Clients/RCC)
10. Enables the Route Control server if it is running in standby mode. This computer then becomes the master. Note: You must use the Route Control Center to enable a Route Control project that was previously loaded onto the server using the Route Control engineering tool.
    See Route Control Center: Server Status
11. Button to restart the server (project engineering is read in again and a general request of the automation systems takes place)
12. Button to terminate the Route Control server. Caution: The Route Control server is shut down. Operation of the routing system is not guaranteed (unless a redundant server takes over control), and the application must be restarted via **Start > SIMATIC > Route Control > Server.**
13. Route Control server license installed: 30, 100, or 300 simultaneous material transports The first number shows the installed license, the right number shows the currently active routes.
14. Indicates whether or not the automation systems are connected.
15. Indicates the user who has logged on, or [unknown] if a no user has yet logged on or the SIMATIC logon package has not been installed.
    See also Route Control Center: Status Bar
16. A small green triangle indicates if the route log is active (file is being written). The tooltip shows the path to the log file.

Note

For a description of the individual stages during startup and shutdown of the Route Control server, refer to Startup Sequence.

A.30.2 RC Server: Switching Languages

General



Description

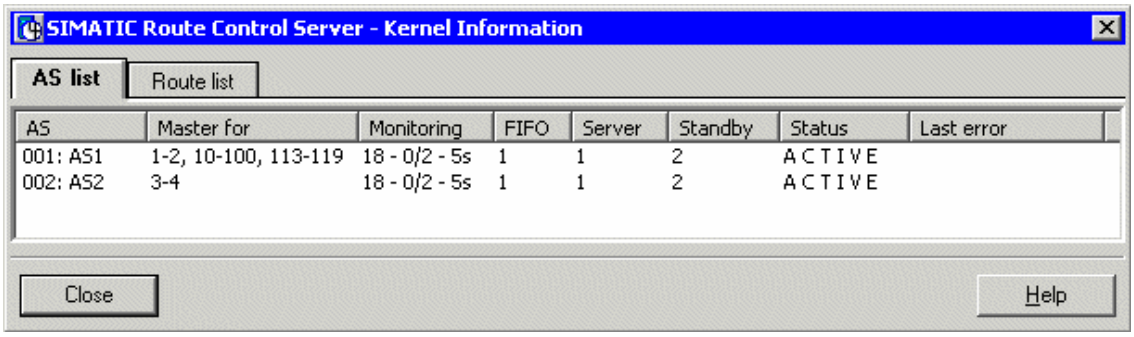
You can select a different language for the Route Control server using the shortcut menu in the Windows taskbar. The languages installed on the computer by the Route Control setup program determine which languages are available for selection.

A.30.3 RC Server: Expanded Diagnostics (AS List)

General

The AS List tab indicates all of the automation systems configured for Route Control and the properties and current status of these automation systems.

Description of Dialog



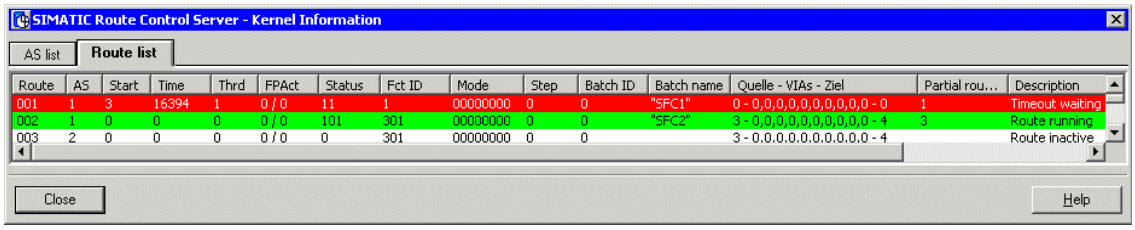
Column	Value	Meaning
AS	001.001 to 239	AS ID
Master for	1.1 to 300	Route IDs assigned to this AS (fixed or dynamic assignment)
Supervising	<dg> - <miss> / <max> - <cy> Example: 39 - 1/10 - 15 39 = last received telegram number 1 = one missing telegram 10 = maximum of 10 telegrams may be missing 15 = 15 seconds of cycle time, that is, timeframe between two telegrams	<dg> 00 to 99 Received telegram number, starts over at 00 after an overflow (99) (datagrams) <miss> 00 to 99 Number of missing telegrams (missing datagrams) <max> 00 to 99 Maximum permissible number of missing telegrams (maximum missing datagrams) <cy> 1 to 999 Cycle time See also Global Settings
FIFO	1 or 4	Number of the FIFO in the AS that is used to connect to this server
Svr	1 or 2	1: First configured computer is the master (RC application (master) 2: Second configured computer is the master (RC application (standby)
Stdby	0, 1, or 2	0: Second computer is not available, this involves a non-redundant Route Control server 1: First configured computer is the standby (RC application (master) 2: Second configured computer is the standby (RC application (standby)
State	RUNNING STANDBY STARTUP	Computer is the master relative to the connected AS Computer is the standby relative to the connected AS Computer is starting up
Last Error	<Text>	Last error that occurred

A.30.4 RC Server: Expanded Diagnostics (Route List)

General

This route ID-oriented view shows the main parameters of a route as represented inside the server (most notably as a number instead of a name).

Description of Dialog



Column	Range of Values	Meaning
Route	1-300	Route ID
AS	1-239	Number of the automation system, see AS_ID
Cnt	0-65535	Route order ID Number of route requests since the server started up This number starts over at 0 once 65535 is reached
Time	0-2 to the power of 32	Total route request time in milliseconds 2 to the power of 32 = 4,294,967,296 Mean route request time = Time / Cnt
Thrd	0 or 1	Internal thread for route request is active (1) or inactive (0)
FPAct	A/B A: 0 or 1 B: 0-65535	A = Faceplate Active bit, that is, at least one Route Control Center is currently monitoring this route (1) or no Route Control Center is connected to this route (0) B = Number of active clients (Route Control Center) currently monitoring this route
State	0-200	Status of route
FuncID	0-65535	Function ID of route Different routes normally use different function IDs unless routes are overlapping.
Mode	...0000-...FFFF	Mode level 32-bit value in hexadecimal format
Step	0-2 to the power of 32	Step number (from BATCH phase)
Batch	0-2 to the power of 32	Batch number
Batch Name	<Text>	Batch name 0 to 32 characters
Source, Via Destination	0.0 to 65,535	Location for source, "via," and destination of route, expressed as a location number
Partial routes	0.0 to 65,535	Number of partial routes involved in this route

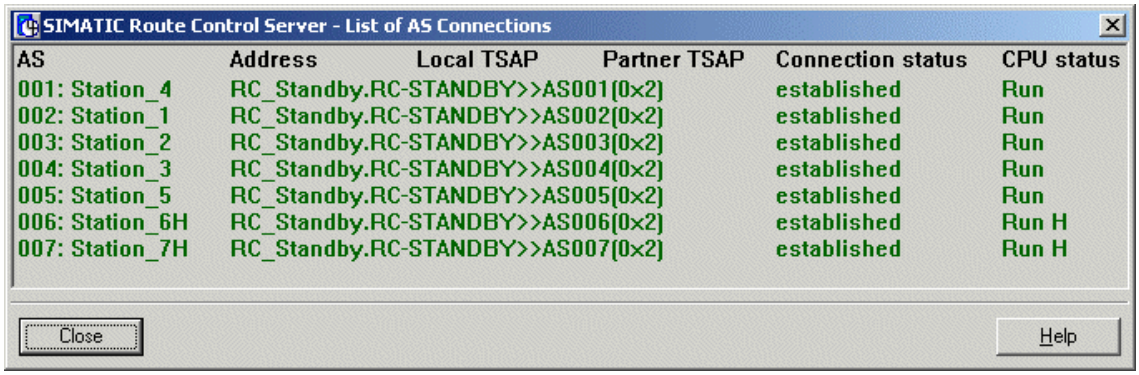
Column	Range of Values	Meaning
Description	<Text>	Status of route from the perspective of the Route Control server Route started Route inactive Route request Route faulty

A.30.5 RC Server: Expanded Diagnostics (OS-AS Connections)

General

This dialog shows the parameters of the Route Control server connections to the Route Control automation systems.

Description of Dialog



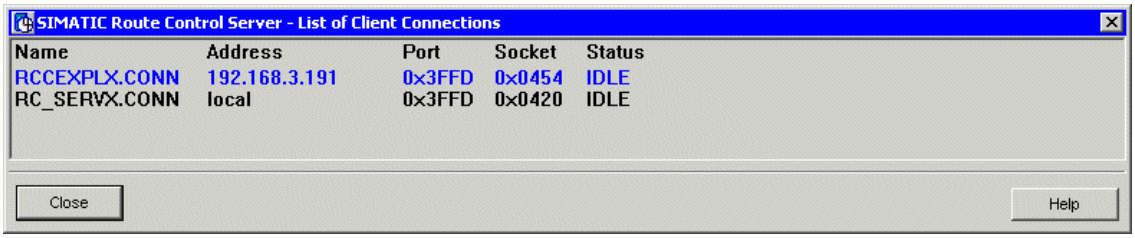
Column	Value	Meaning
AS	1.1 to 239	AS ID
Address (address)	<mac address>	MAC address of the AS in hexadecimal format
Local TSAP (local TSAP)	Compare NetPro	TSAP (Transport Service Access Point) on the server
Remote TSAP (remote TSAP)	Compare NetPro *Or* Disconnected	TSAP (Transport Service Access Point) to the peer, in this case, the automation system Automation system is disconnected, communication is not taking place between the automation system and the Route Control server.
Connection state (connection state)	Established, …	Status of connection
CPU state (cpu state)	"Run" "Stop"	Status of the CPU in the AS. A status followed by an H indicates an H-machine.

A.30.6 RC Server: Expanded Diagnostics (Clients/RCC)

General

This dialog shows the connections of the Route Control clients and the Route Control server, that is, the client applications currently connected to the server.

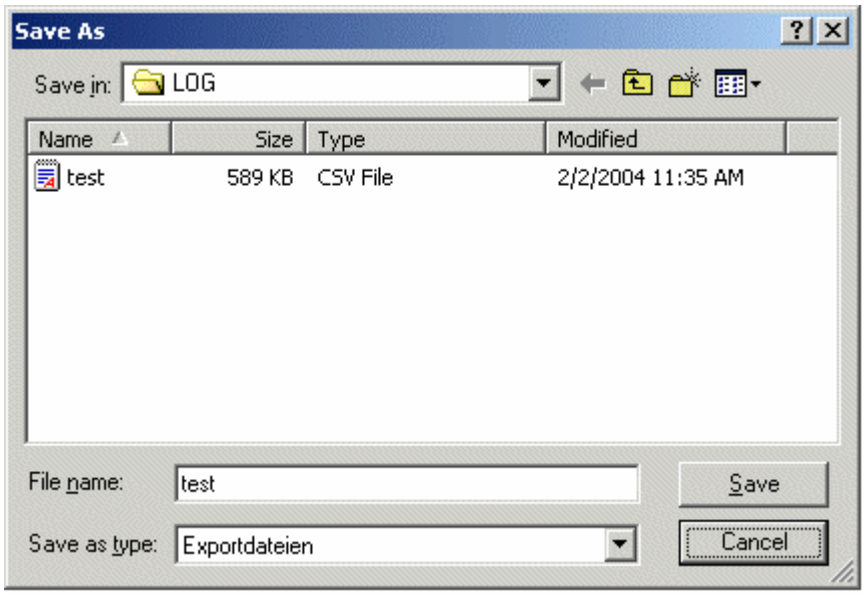
Description of Dialog



Column	Value	Meaning
Name	Character string	Name of connection
Address	Local or IP address	IP address of the computer where the Route Control Center that is connected to the server is running.
Port		Port on the server to which the client computer is connected and with which data are exchanged.
Socket		IP socket used to connect the server to this client
State	IDLE	Status of connection: IDLE: No data transmission ReadBst: Client is reading data from the server WriteBst: Client is writing data to the server

A.31 Route Control Route Log

A.31.1 Route Log (Interface - Export)

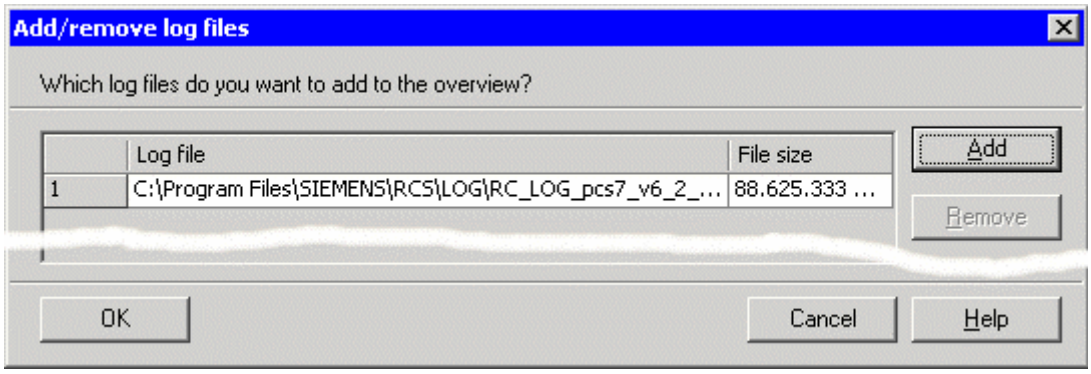


In the "File \ Export" menu item or using the function bar, open the file export dialog, enter a file name, and confirm your entry.

The currently visible columns are always exported to a file. In the "View \ Select Columns" menu item and the "Filter" window, note the settings, which could be active, and could thus determine which files are to be exported.

The export file configuration is similar to that of the log file: the columns are separated by a semicolon. Because of its format, an export file can be used in other media, such as Microsoft Excel.

A.31.2 Route Log (Adding/Removing Log Files)



Using the "File \ Add/Remove Log" menu command or the function bar, open the dialog that allows you to add or remove log files.

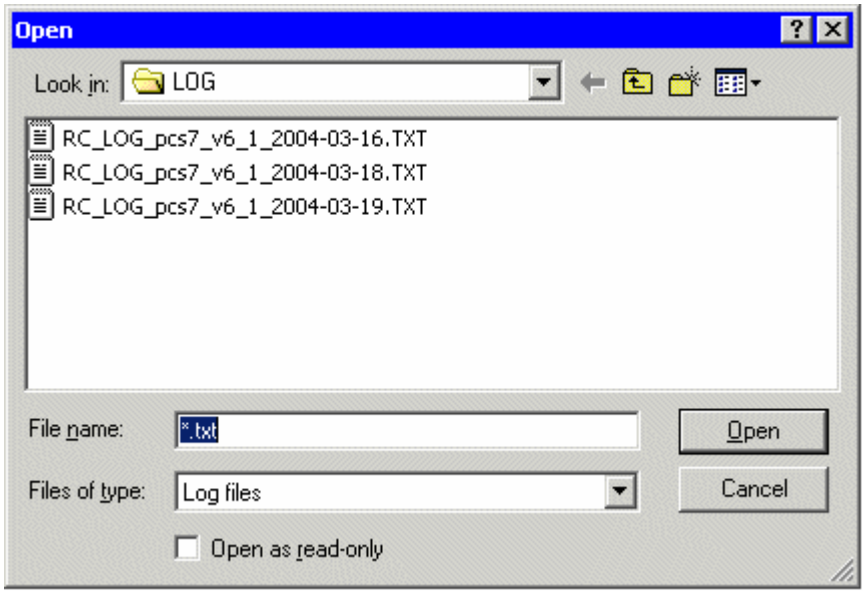
Adding Files

Press the "Add" button to open another dialog, and in this dialog, select one or more files from → Route Log (Add Log File)

Removing Files

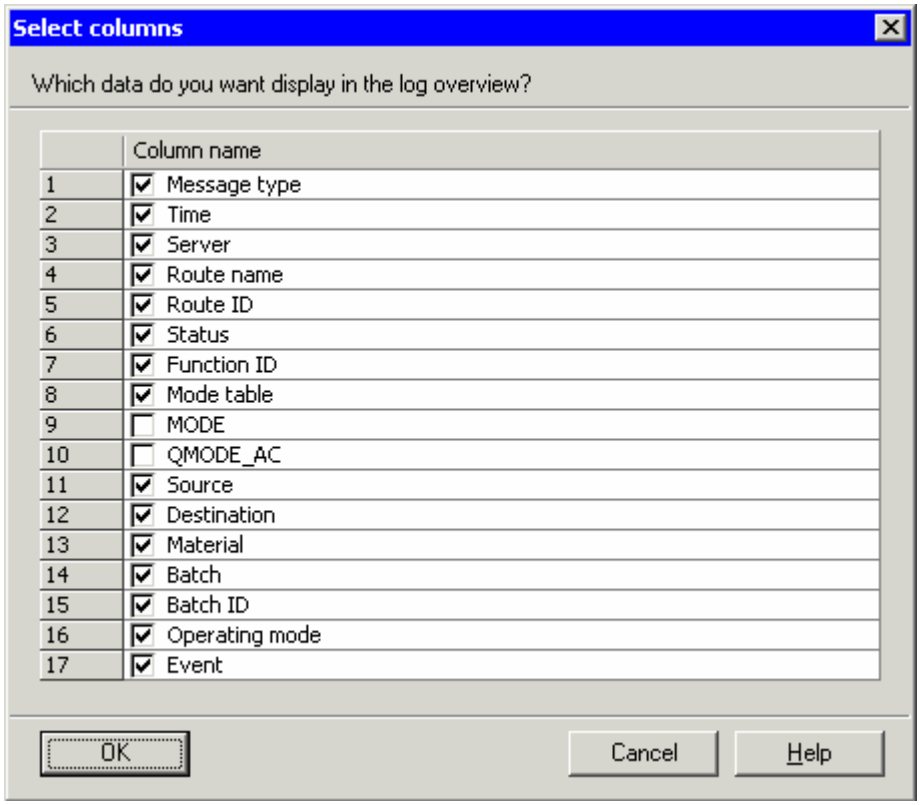
Select one or more files in the list by clicking in the field with the number (in this case, 1). Then press the "Remove" button → The log files will be removed from the list, and the data will no longer be displayed.

A.31.3 Route Log (Adding a Log File)



Select one or more files to be displayed in the route log application.

A.31.4 Route Log (Selection of Visible Columns)



You the user can specify which columns will be displayed. The following columns are available. Note that during an export operation, only the visible columns are transferred.

You will find a description of each column under Route Log (Columns)

A.32 Messages

A.32.1 Overview of RC Messages

Route Control produces messages in two ways: via blocks in the AS and through Route Control messages in WinCC:

Route Control Messages, AS

	System messages	Route Control Messages, AS (System, FB850)
	Route	Route Control Messages, AS (Route, FB800)
	Control elements	Route Control Messages, AS (Control Elements, FB822, 823, 824, 825)
	Sensor elements	Route Control Messages, AS (Sensor Elements, FB845, 846)
	Remote blocks	Route Control Messages, AS (Remote Elements, FB831, 833)

Route Control Messages, OS

	System messages	Route Control Messages, OS (System, Server)
	Route messages	Route Control Messages, OS (Route, Server)

Route Control Messages (Operator Messages)

	Operator messages	Route Control Messages (Operator Messages)

A.32.2 OS Messages

A.32.2.1 Route Control Messages, OS

Messages

	Route Control Messages, OS (System, Server)
	Route Control Messages, OS (Route, Server)

A.32.2.2 Route Control Messages, OS (System, Server)

Message Class	Message Type
Process controlling mes	System

Message	Cause
RCS x: Startup error	The RC server cannot start up.
RCS x: Project access error	Server has no access to the project engineering database. → The path must be enabled on the server computer (directory enable RC_LOAD). See Shared Directory 'RC_LOAD' on the RC Server
RCS x: Project loading error	The project engineering database could not be loaded. → Reload and enable the project engineering
RCS x: Server failed	An RC server failed. The peer server detected and reported the failure →Restart the failed server.
RCS x: AS <Name> failed	The connection layer is reporting the failure of an AS or the AS can no longer be accessed. →Check the connection to the AS indicated in the RC server.
RCS x: AS <Name> compression error	When a route element list is written to the specified automation system, an error is reported by the connection layer or the automation system. → The RC server failed in its attempt to compress the loading memory. This error could have been caused by simultaneous use of other tools, e.g. STEP 7 in debug mode, to access the automation system. → Exit debug mode and request the route again, if necessary.
Operation: Set AS... to maintenance	The operator has requested the "Maintenance" state for this AS through the RC Center

Message	Cause
Operation: Release AS...	The operator has requested the "Production" state for this AS through the RC Center (the AS should leave the "Maintenance" again)
Srv: AS... to maintenance	The RC server reports that an AS is switched to the "Maintenance" state. Active routes are completed between the time the operator makes a request and the actual transition to the "Maintenance" state (see also AS to Maintenance)

Message Class	Message Type
Status Messag	Status OS

Message	Cause
RCS x: Start	RC server is being restarted. → No error, for information only
RCS x: End	RC server operation is being ended. → No error, for information only
RCS x: Project loaded	The RC server has read in a new project engineering database. → No error, for information only

Note

X refers to Computer 1 or 2.

1 = RC application (server)

2 = RC application (standby)

A.32.2.3 Route Control Messages, OS (Route, Server)

Message Class	Message Type
Process controlling mes	System

Message	Cause
Route request error: <source> → <destination>	An error occurred during the route request; additional messages have been created by the route block of the AS and by the RC server. →Depends on the cause of the error; for example, select another source and destination location, or first release occupied elements.
Route request cancellation: <source> → <destination>	The route request has been canceled → By the user program in the AS → Manually by the user in the Route Control Center
<Name> partial route is currently being used	The route that was found contains a partial route already occupied by another route. →End the other route first.
<Name> element is currently being used	The route that was found contains an element already occupied by another route. →End the other route or enable "parallel routes" by assigning the same function ID to both routes.
<Name> element is in manual mode	The route that was found contains an element that is still in manual mode. →Open the faceplate for this element and switch over to automatic mode; then repeat the route request.
<Name> element is faulty	The route that was found contains an element that is still faulty. →Eliminate the cause of the fault in this element and repeat the route request.
<Name> element is in maintenance	The route that was found contains an element that is still in maintenance. →First take the element out of maintenance and then repeat the route request.
<Name> maintenance is affecting the element	The route that was found contains an element that is itself not in maintenance but is affected by maintenance of another element. →Take the other element that is in maintenance mode out of maintenance and repeat the route request.
<Name> element command is illegal	The route that was found contains an element with an illegal element command. →Contradictory commands are being applied to an element in the same mode (for example, open valve and close valve). Change the project engineering, repeat loading the server, and repeat the route request.

Message	Cause
Material error in <Name> element	The route that was found has a linking element containing a material that is not a permissible successor to the new material. →Change material for route request (MATERIAL input in the RC_IF_ROUTE) →Allow new material as a succeeding material (material configuration in the RC engineering tool) →Force transfer of the new material in the route (MT_CK_EN input in the RC_IF_ROUTE block) without a check
<Name> element is locked	The route that was found contains a locked element and thus cannot be used for material transport. →Search for an alternative route by changing the source and/or destination locations. Remove the element lock and repeat the route request.
General server error	An internal error has occurred. → If necessary, more detailed diagnostics are available using the trace server. See Diagnostics - Trace
Error downloading route list to AS	The list of elements could not be downloaded to at least one of the automation systems → Repeat route request and download operation. → Check connections (network) between the server and the automation systems → Is AS in Stop mode? → Can AS be accessed with STEP 7?

Message Class	Message Type
Status Messag	Status OS

Message	Cause
Route request start: <source> → <destination>	Route request, including information on source and destination locations, has been received in the RC server
Route request is OK: <source> → <destination>	Route request successful; a route has been found

Note

X refers to Computer 1 or 2.

1 = RC application (server)

2 = RC application (standby)

A.32.3 AS Messages

A.32.3.1 Route Control Messages, AS

Messages

	Route Control Messages, AS (System, FB850)
	Route Control Messages, AS (Route, FB800)
	Route Control Messages, AS (Control Elements, FB822, 823, 824, 825)
	Route Control Messages, AS (Sensor Elements, FB845, 846)
	Route Control Messages, AS (Remote Elements, FB831, 833)

A.32.3.2 Route Control Messages, AS (System, FB850)

Message Class	Message Type
Process controlling mes	Error

Event ID	Event Signal	Message	Cause
EV_ID1	SIG1	Initialization of Route Control master server aborted	Connection to the server cannot be established. Check the settings in NetPro (connection status). Is the RC server running?
EV_ID1	SIG2	Communication error in Route Control master server	Connection has been interrupted (network error? is the RC server running?)
EV_ID1	SIG3	Initialization of Route Control standby server aborted	Connection to the server cannot be established. Check the settings in NetPro (connection status). Is the RC server running?
EV_ID1	SIG4	Communication error in Route Control standby server	Connection has been interrupted (network error? is the RC server running?)
EV_ID1	SIG5	No connection has been configured to the RC master and RC standby	Start the Route Control Wizard with the AS-OS connection option.
EV_ID1	SIG6	Route Control AS ID error	The AS ID is outsize the valid range in the RC_IF_CFG. Start the Route Control Wizard with the 'Data synchronization' option.
EV_ID2	SIG1	Server communication is not being processed	The RC_IF_CFG.OB_COMM input contains an illegal value. See also RC_IF_CFG (FB850)
EV_ID2	SIG2	Route Control system is not being processed	The RC_IF_CFG.OB_SYS input contains an illegal value. See also RC_IF_CFG (FB850)

Event ID	Event Signal	Message	Cause
EV_ID2	SIG3	AS-AS communication is not being processed	The RC_IF_CFG.OB_XC input contains an illegal value. See also RC_IF_CFG (FB850)
EV_ID2	SIG4	AS-AS communication failure	Communication between two RC automation systems has been interrupted. Network? RC_IF_CFG.ConnASXX (XX = 01 to 32) At least one of these outputs supplies an error value → that can be used to find the AS experiencing communication problems. You can obtain detailed information by creating the index (XX) of the respective AS in the RC_IF_CFG.DiaConIndx input. See outputs Dia... in RC_IF_CFG (FB850)

Message Class	Message Type
Operation messa	Process message

EV_ID1	SIG7	All control elements of this AS are in simulation mode	No error, for information only. The RC_IF_CFG.CE_SIMU input has the value "1". Feedback for all control elements of this AS are simulated internally according to their control. Intended for commissioning phase without hardware.
EV_ID1	SIG8	All sensor elements of this AS are in simulation mode	No error, for information only. The RC_IF_CFG.SE_SIMU input has the value "1". Feedback for all sensor elements of this AS is not considered when evaluating the mode level. Intended for commissioning phase without hardware.

A.32.3.3 Route Control Messages, AS (Route, FB800)

Message Class	Message Type
Process controlling mes	Error

Note

Messages for starting, stopping, and pausing a route must be explicitly enabled by the user. See input parameters EV_ID4, Sig5 to Sig8 below. To enable messages, input EN_DIA_M on RC_IF_ROUTE (FB800) must be set from 0 to 1.

See also RC_IF_ROUTE.QRET_VAL

Event ID	Event Signal	Message	Cause
EV_ID1	SIG1	Error transferring route list to AS	Check the status of the connections to the AS using the RC server (menu: Connection / Connections) Check the network connection to the AS (cable)
EV_ID1	SIG2	Time exceeded during route request	The Route Control server did not respond to the route request within the monitoring time period. See RC_IF_ROUTE.REQ_TIME. → Is the RC server running? → Increase time, maximum of 240 s.
EV_ID1	SIG3	Unassigned/available route not found	An available route was not found for the specified location (general). → Route search offline in engineering tool. See Guideline: Route search 'offline'
EV_ID1	SIG4	Element(s) or partial route(s) are currently being used	An available route was not found for the specified location (at the present time). → Repeat the request at a later time → Route search offline in engineering tool. See Guideline: Route search 'offline' → Check the request details in the Route Control Center. See Route Control Center: Error during Route Request

Event ID	Event Signal	Message	Cause
EV_ID1	SIG5	Illegal location	At least one of the source, destination, or via locations is illegal. → Source/destination > 0? → Is the source different from the destination? → Are the source, destination, and via locations present in the RC engineering project?
EV_ID1	SIG6	Status of element(s) is incorrect	A route has been found, but at least one of the elements contained in the partial routes is locked for Route Control. → Check request details. See Route Control Center: Error during Route Request → Is the element locked? → Is the element in maintenance? → Is the element in manual mode? → Is the element in error status?
EV_ID1	SIG7	Material compatibility error	a) A new material in the route request is not compatible with the preceding material. → Check/change the succeeding material →Repeat route request → Check the material configuration. See Project Engineering of Material Sequences b) Material cannot be saved in the linking elements for the route in progress because of an incompatibility with the preceding material. → Check/change the succeeding material → Save material → Check material configuration. See Project Engineering of Material Sequences

Event ID	Event Signal	Message	Cause
EV_ID1	SIG8	Route ID error	The RC_IF_ROUTE.ROUTE_ID route is illegal, or the RC has not yet written valid route IDs to the AS (for example, following a complete download to the AS). → Load project engineering onto RC server. See Loading the Route Control Server → Enable project engineering (Route Control Center) Route Control Center: Server Status and Updating the Route Control Server → Start RC wizard with 'Data synchronization' option See Route Control Wizard: Selection of Actions and Guide: Exporting Routes
EV_ID2	SIG1	Route data block is not available	At least one of data block in the range DB 101 to DB 400 is missing. See → RC_IF_ROUTE.QROUTE_DB and QID. Missing data block (no.) = QID + 100.
EV_ID2	SIG2	Cross-coupling error	Master or slave AS has been reloaded (route DB has been overwritten). → Repeat route request because the route list was invalid.
EV_ID2	SIG3	Cross-coupling time monitoring error	120 s monitoring time has elapsed. → Is the slave AS of the route running? If so, perform a restart. → Has the slave AS been reloaded? If so, repeat route request.
EV_ID2	SIG4	CE/SE device error	At least one control element or sensor element of the route is returning a device error. → Eliminate the error in the element (outside of the routing system).
EV_ID2	SIG5	Status monitoring time error	After a mode was activated, at least one of the elements involved in this mode in the route could not be switched on within the monitoring time. That is, the expected feedback was not signaled by the element to route on time. →Check the element for errors or faults. If necessary, increase the monitoring time.

Event ID	Event Signal	Message	Cause
EV_ID2	SIG6	Fault tolerance time error	Once a mode has been activated and all elements signal the expected feedback, the fault time (or fault tolerance time) begins to elapse as soon as an element is no longer at its SET position. →Check the element for errors or faults. If necessary, increase the monitoring time.
EV_ID2	SIG7	Rest position error	At least one element has left is rest position (for longer than the fault tolerance time) when the mode level was disabled. → Check element (outside the routing system)
EV_ID2	SIG8	Invalid route data in the route list	As a result of a manual request, static parameters (source, destination, material, mode table, etc.) have been changed in the Route Control Center for a route in progress. The route in progress was then switched back to automatic mode. → Deactivate route manually → Switch the route back to automatic mode → Repeat route request (if the user program is to be executed automatically)
EV_ID3	SIG1	General error	Check RC_IF_ROUTE.QRET_VAL.
EV_ID3	SIG2	No available route ID found	An available route ID is no longer available in this AS, or RC has not yet written valid route IDs to the AS. → Load and enable the server → Provide more resources (configure a larger range of available route IDs)
EV_ID3	SIG3	Automation system is not configured for this route ID	Inconsistent data between the AS and its routes (ID) and the Route Control project engineering. → Execute Route Control Wizard with 'Data synchronization' option. → If necessary, compile CFC charts and download them to the AS. → If necessary, reload the RC server.

Event ID	Event Signal	Message	Cause
EV_ID3	SIG4	Material save failed	Material compatibility error Monitoring time expired when material was being saved in the linking elements → See 'Material compatibility error' message → RC_IF_ROUTE.MAT_TIME

Message Class	Message Type
Status Messag	Status AS

Event ID	Event Signal	Message	Cause
EV_ID4	SIG3	Route is being controlled in manual mode/RCC	For information only
EV_ID4	SIG4	Route is being controlled in automatic mode	For information only
EV_ID4	SIG5	Route is ready for start	For information only
EV_ID4	SIG6	Route is changing to "Running" status	For information only
EV_ID4	SIG7	Route is ended	For information only
EV_ID4	SIG8	Route is changing to "Hold" status	For information only

A.32.3.4 Route Control Messages, AS (Control Elements, FB822, 823, 824, 825)

Message Class	Message Type
Operation messa	Process message

Event ID	Event Signal	Message	Cause
EV_ID1	---	CE is reporting an external error	Upstream element is faulty → Eliminate fault (outside the routing system) → The route response can be set. See control element property 'Ignore errors' in the RC engineering project Control Element (Properties)
EV_ID2	---	CE is in simulation mode	No error, for information only. The RC_IF_CFG.CE_SIMU input has the value "1" or the RC_IF_....MONITOR input has the value "1". Feedback for this AS control element is simulated internally according to its control. Intended for commissioning phase without hardware.
EV_ID3	---	CE is locked for Route Control See also LOCK Input on Element Blocks	No error, for information only. → Element is locked for the next route request → Input LOCK = 1 → Input DISABLED = 1 → Input PEND_OOS = 1 → Input MAN_AUT = 0 → Check upstream element (outside the routing system)

A.32.3.5 Route Control Messages, AS (Sensor Elements, FB845, 846)

Message Class	Message Type
Operation messa	Process message

Event ID	Event Signal	Message	Cause
EV_ID1	---	CE is reporting an external error	Input ERROR = 1 → Eliminate fault (outside the routing system)
EV_ID2	---	SE is locked for Route Control	No error, for information only. → Element is locked for the next route request → Input DISABLED = 1

A.32.3.6 Route Control Messages, AS (Remote Elements, FB831, 833)

Message Class	Message Type
Process controlling mes	Error

Event ID	Event Signal	Message	Cause
EV_ID1	SIG1	Remote process cell: BSEND block communication error	Communication error between AS-AS. Output RC_IF_REMOTE_SEND / RECV Check.S_HISTORY, which contains the most recent error message of the internally called BSEND block. See also RC_IF_REMOTE_SEND (FB831) and RC_IF_REMOTE_RECV (FB833)
EV_ID1	SIG2	Remote process cell: BRCV block communication error	Communication error between AS-AS. Output RC_IF_REMOTE_SEND / RECV Check.R_HISTORY, which contains the most recent error message of the internally called BRCV block. See also RC_IF_REMOTE_SEND (FB831) and RC_IF_REMOTE_RECV (FB833)
EV_ID1	SIG3	Remote process cell: Communication time exceeded	Communication error between AS-AS. Check inputs and outputs: →SND_TIME →ERR_SND →ERR_RCV → Check NetPro settings (connection status) → Check peer automation system: RC_IF_REMOTE_SEND / RECV: →SND_TIME →ERR_SND →ERR_RCV See also RC_IF_REMOTE_SEND (FB831) and RC_IF_REMOTE_RECV (FB833)

A.32.4 Operator Messages

A.32.4.1 Route Control Messages (Operator Messages)

Message Class	Message Type
Operator message	Operator message.

Message	Cause
Hold route 2? →Yes	User is controlling this route in manual mode, and each message is being logged...
Hold route 2? →No	... even if it has been canceled.
Additional operations, such as start, stop, etc.	

A.33 Value Ranges

A.33.1 Overview of Valid Value Ranges

Here you will find an overview of all value ranges in one place. These value ranges are valid for inputs and outputs (parameters) of blocks in the Route Control library as well as the Route Control project engineering application and your Route Control project. The quantity framework for Route Control is presented in a separate section, Quantity Framework for Route Control, as not all objects included in the quantity framework are input or output parameters in terms of the following summary. Available ranges:

- Valid Route IDs
- Valid Function Identification
- Maximum Valid Route Request Time
- Maximum Valid Material Acceptance Time
- Valid Material IDs
- Valid ID Ranges for CEs, SEs, LEs, and PEs
- Valid SNDRCVDB Block Numbers for Remote Elements
- Valid AS Numbers
- External Parameter Elements (Index)
- Value ranges for unit ID and node ID, see Quantity Framework for Route Control
- Limitation with regard to. Chart-in-Chart Technology

A.33.2 Valid Route IDs

Block

RC_IF_ROUTE (FB800)

Parameters and Value Ranges

Parameter	Min.	Max.	Comments
ROUTE_ID	1	300	Up to 300 material transports can be performed simultaneously. More than 300 RC_IF_ROUTE blocks can actually be configured, that is, inserted in CFC charts. However, the concept of dynamic ID assignment must be implemented in this case. See Guide: Dynamic ID Assignment

Note

The route ID should be assigned once for routes and left unchanged afterwards.

For every route ID used in an automation system, the corresponding data block must be available and downloaded to this AS and all (slave) ASs involved in the route.

Data block number = 100 + route ID, that is, DB number = 101 to 400

A.33.3 Valid Function Identification

Block

RC_IF_ROUTE (FB800)

Parameters and Value Ranges

Parameter	Min.	Max.	Comments
FUNC_ID	0	32.000	0: System uses the route ID as the function ID 1..300: Used by the system 301..32.000: Used by the user

A.33.4 Maximum Valid Route Request Time

Block

RC_IF_ROUTE (FB800)

Parameters and Value Ranges

Parameter	Min.	Max.	Comments
REQ_TIME	1	240	In seconds

A.33.5 Maximum Valid Material Acceptance Time

Block

RC_IF_ROUTE (FB800)

Parameters and Value Ranges

Parameter	Min.	Max.	Comments
MAT_TIME	1	255	In seconds

A.33.6 Valid Material IDs

Block

RC_IF_ROUTE (FB800)

Parameters and Value Ranges

Parameter	Min.	Max.	Comments
MATERIAL	0	1.024	0 = No material in the linking element, transport medium is 'empty' 1..1,024 = Material in transport medium

A.33.7 Value Range for IDs of CEs, SEs, LEs, and PEs

Block

RC_CE_COMMON (FB827)

RC_IF_CONDUCT (FB846)

RC_IF_LE (FB828)

RC_IF_MOT_REV (FB823)

Parameters and Value Ranges

Parameter	Min.	Max.	Comments
CE ID	1	1.024	This element ID is unique within one automation system. In the next automation system, these IDs start over at 1.
SE ID	1	1.024	This element ID is unique within one automation system. In the next automation system, these IDs start over at 1.
PE ID	1	1.024	This element ID is unique within one automation system. In the next automation system, these IDs start over at 1.
LE D	1	1.024	This element ID is unique within one automation system. In the next automation system, these IDs start over at 1.

Note

With a number of blocks, in particular, interface blocks for elements, the Route Control Wizard helps you with automatic and unique ID assignment.

A.33.8 Value Range for SNDRCVDB for Remote Elements

Block

RC_IF_REMOTE_SEND (FB831)

Parameters and Value Ranges

Parameter	Min.	Max.	Comments
SNDRCVDB	51	95	All block numbers in this range can be used. The corresponding block must be available in the local AS and the remote peer AS, and the same number must be used in both automation systems. DB51 to DB90 are data blocks from the user area. The user must synchronize numbers used for Route Control with their own numbers.

A.33.9 Value Range for AS Numbers

Block

RC_IF_CFG (FB850)

Parameter Name and Value Range

Parameter	Min.	Max.	Comments
RC_AS_ID	1	239	Up to 32 automation systems can be used in a Route Control project. Each automation system must be assigned a unique ID, which is used to reference the AS within the context of Route Control.

A.33.10 External Parameter Elements (Index)

Block

RC_IF_ROUTE (FB800)

Parameters and Value Ranges

Parameter	Min.	Max.	Comments
QINDEX	1	24	Up to 24 external parameter elements can be referenced in a route.

A.34 Quantity Framework

A.34.1 Quantity Framework for Route Control

The quantity framework is valid for the scope of one Route Control project, that is, an S7 standalone project or an S7 multiproject, depending on the configuration.

Note

The specifications provided below are theoretical limits. Because many different program parts (in addition to Route Control) are implemented in an automation system, the elements of Route Control themselves are also distributed across multiple automation systems.

Moreover, the number of message block calls (AlarmS and SFC18) in PCS 7 is restricted due to the new message concept. The reason for this and its effects on Route Control are described in Limitation of Quantity Framework.

Object	Min.	Max.	Comments
Routes	1	N	You can insert as many instances of block type RC_IF_ROUTE as you wish in your S7 project/CFC charts. This applies equally if you are using the concept of dynamic ID assignment. Only the number of material transports occurring simultaneously during runtime (that is, the number of instances actively controlling a route and its elements) is limited.
Material transports	1	300	This is the number of simultaneously active (operating) routes during runtime, that is, instances of block type RC_IF_ROUTE.
Control elements (CE)	1	1.024	Per AS
Sensor elements (SE)	1	1.024	Per AS
Parameter elements (PE)	1	1.024	Per AS
Linking elements (LE)	1	1.024	Per AS
Automation system	1	32	Number of automation systems that can be controlled by Route Control. An automation system number ranges between 1 and 239.
Partial routes	1	64.000	Per RC project
Route control element (RCE)	1	64.000	Over all partial routes of the entire Route Control project

Object	Min.	Max.	Comments
Interconnected elements per route per AS	0	450	One route can accommodate up to 450 interconnections per AS and control these elements. If a route runs on more than one AS, these values are added. Thus, one route can control more than 1,000 interconnected elements via 3 automation systems. The route search can be influenced by specification of intermediate (via) locations. If one element is interconnected multiple times in different mode levels (for example, 3 times in the same partial route), this counts as three elements.
Elements per partial route	0	64.000	A purely theoretical limit, limited in practice by the number of elements per AS.
Server	1	2	1 = RC application (server) 2 = RC application (server + standby)
Element subtypes	1	255	Number of subtypes allowed for control elements (CEs), sensor elements (SEs), and parameter elements (PEs)
Modes / mode levels	1	32	Per mode table/function table
Mode table/ function table	1	64.000	Limited by the Route Control database, even though the MODETABLE parameter in RC_IF_ROUTE is a DINT-type parameter.
Configuration chart (CFC)	1	1	Exactly one chart per AS. Thus, up to 32 charts for 32 ASs
Locations	0	64.000	SOURCE / DEST parameter in RC_IF_ROUTE ?
Process cells (PCell)	0	64.000	Limited by plant hierarchy in SIMATIC Manager
Unit (Unit)	0	64.000	Limited by plant hierarchy in SIMATIC Manager
Material	0	1.024	Limited by RC_IF_ROUTE
Material group	0	1.024	Limited by Route Control database
Sequential relationships	0	64.000	Limited by Route Control database

A.35 Diagnostics / Log

A.35.1 Diagnostic Trace

The Trace Server installed with Route Control is not intended for operating personnel. Rather, it is a special tool for detailed diagnostics by experts such as commissioning personnel. While the information displayed is complex, it can also be used by the hotline to diagnose and quickly locate the cause of a fault. With some practice, valuable information can be obtained even during the commissioning phase. For this reason, a brief description of the tool is provided here.

A.35.2 Diagnostics Overview

Route Control offers experienced users a series of expanded diagnostic options for the following levels:

- Diagnostics for Cross Coupling (automation system)
- Diagnostics for Export and Import of Project Engineering Data (engineering)
- Diagnostics for Operator Control & Monitoring (operating personnel)

These diagnostic options are not intended for operating personnel, but rather for configuring engineers and commissioning personnel.

A.35.3 Diagnostics for Engineering

Route Control creates log files at various times. Once an operation is complete, the user can open these log files with an editor.

- CSV Interface (Export Log) (Export from Route Control Project)
- CSV Interface (Import Log) (Import to Route Control Project)
- Route Control Wizard (Export Log) (Export from S7 Project)
- Route Control Wizard (Import Log) (Import to Route Control Project)
- Route Control Engineering: Checking Data Consistency (Route Control Project)

Note

For all log files, time stamps are indicated in the individual segments so that the duration of an operation can be calculated.

A.35.4 Diagnostics for Operator Control and Monitoring

General

The Trace Server application always operates locally instead of over a network. For this reason, the application must always be started on the computer where the application to be diagnosed is running (for example, the Route Control Center or the Route Control server).

Procedure

- Start Trace Server via..\siemens\rcs\bin\rctrcsrv.exe
- Select the application to be diagnosed. The Trace Server displays only those applications that are currently running (that is, applications that are in the main memory and have logged on in the Trace Server.
- Set the scope of messages to be displayed (diagnostic, information, warning, error)

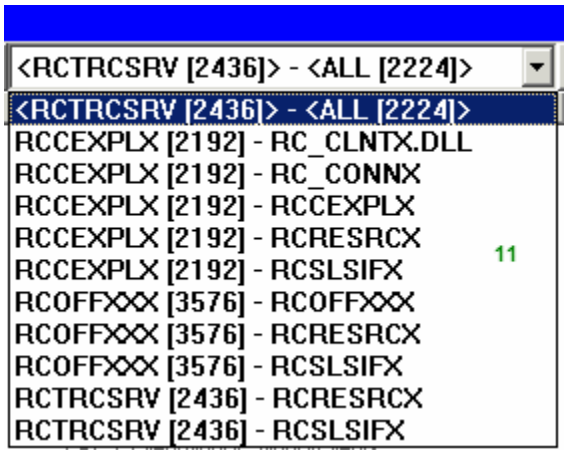
Meaning of Display Elements

#	Meaning
1	When element is depressed, the Trace Server is always the top-most application
2	Enable and disable generation of messages in the window
3	Enable and disable automatic scrolling
4	Enable and disable output in a trace file
5	Delete messages in the window
6	Suppress output of all messages for all applications in the window

#	Meaning
7	Diagnostic level 1: Display diagnostic messages
8	Diagnostic level 2: Display informational messages
9	Diagnostic level 3: Display warning messages
10	Diagnostic level 4: Display error messages

Note

During normal operation, diagnostic level 3 and 4 messages (warning and error messages) should not appear.



#	Meaning
11	Left: Name of application (EXE), as shown in the Task Manager, including its process ID Right: Name of module within the application

The primary applications are listed in the table below. As a general rule, it is sufficient to set the switch for the various diagnostic levels (diagnostic, informational, warning, and error) for the application on a global basis.

Name	Meaning
RC_SERVX	Route Control server (runtime)
RCCEXPLX	Route Control Center (runtime)
RCCONVTX	Route Control conversion tool (engineering)
RCEXPAXX	Route Control export wizard (engineering, SIMATIC Manager context)
RCOFFXXX	Route Control engineering tool (engineering)

Diagnostic Profile Files

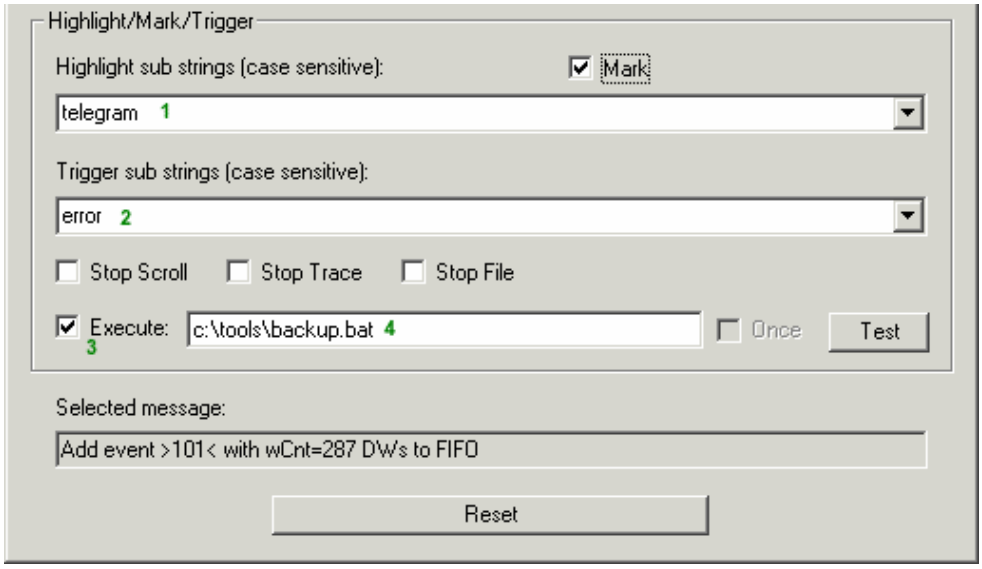
The settings can also be saved and reloaded later. To do so, right-click in the window containing the messages to open the context menu. Select 'Load Profile' or 'Save Profile.'

Filter Criteria

Another interesting option allows filter criteria to be set for the messages themselves. In this way, you can provide a color background for messages containing a particular character string so that they stand out from the other messages and can be more easily distinguished.

Open the configuration dialog by double-clicking or by using the context menu in the message window.

Running an Application When Certain Events Occur



#	Meaning
1	If the character string 'telegram' occurs in a message, color shading is applied to this line.
2	If the character string 'error' occurs in a message, the file indicated in item 3 is executed.
3	Activate and deactivate startup of an application
4	File to be executed, including its path

A.35.5 Diagnostics for Export and Import of Project Engineering Data

---

A.35.6 Diagnostics for Cross-Coupling

Route Control offers two blocks from the library for diagnosing the cross-coupling between the Route Control automation systems. These blocks provide information on the status of the connection:

- RC_IF_XC_DIAG (FB884)
- RC_IF_XC_LIFE (FC884)

A.35.7 Diagnostics for RC Server

A log file can be generated using the Trace Server application. See

Diagnostic Trace

A.36 FAQ

A.36.1 Subsequent Modification of AS-ID

Question

How can I make subsequent changes to an automation system ID without losing its elements or element interconnections in the RC engineering project?

Answer

1. Create a copy of the Route Control project file.
   (S7 project or S7 multiproject path../Global/RCS/RCS.mdb)
2. Open the Route Control project engineering via the S7 project.
3. Perform a complete CSV export.
   (all elements, locations, partial routes, and interconnections)
4. In the CFC charts on the RC_IF_CFG blocks, change the RC_AS_ID parameter in accordance with the required AS-ID
5. Call the Route Control Wizard and specify the following export option:
   Data synchronization for all elements
   AS-AS connection
   AS-OS connection
   → The wizard will then make any necessary changes to the NetPro settings and CFC configuration
   → i.e., a partial load of charts and a reload of connections must be performed.
6. Open the Route Control project engineering via the S7 project and perform an S7 import. Note: All interconnections between elements and partial routes will be deleted, but the partial routes will not be deleted.
7. Perform a complete CSV import.
   (CSV will reimport the interconnections using the automation system name rather than the RC AS-IDs, i.e. the previous interconnections should again be available following the CSV import)
8. Load the Route Control server database and update the Route Control Center.

A.36.2 AS Load Due to Route Execution

Question

How much load is generated in an automation system when route blocks are executed?

Answer

The load depends primarily on the type of CPU and the following factors:

- Number of configured routes (parameter L(Wp))
- Number of active routes (parameter L(Wa))
- Base load of RC system blocks (parameter L(Cfg))
- Load due to AS-AS connection and AS-server connection (parameter L(K))

The load in the automation system is specified with L(AS-RC). This gives the following formula:

L(AS-RC) ≈ L(Wp) + L(Wa) + L(Cfg) + L(K), whereby

L(Wp)	≈	2.2.6 ms * number of configured routes
L(Wa)	≈	1.1.5 ms * number of active routes
L(Cfg)	≈	4.4.0 ms (occurs only once per automation system and is therefore fixed)
L(K)	≈	2.2.5 ms * number of configured routes + 26 ms

Note

There is an added load due to the processing of elements, i.e., the overall load also depends on the number of elements involved in the route.

There is also an added load due to other blocks (other than for Route Control) when you wish to calculate the overall load of the automation system, e.g., SFCs, batch blocks, etc.

Example

In an automation system, 75 routes are configured, of which 40 are active. This produces the following load due to Route Control:

L(AS-RC) ≈ 2.6 ms * 75 + 1.5 ms * 40 + 4 ms + 2.5 ms * 75 + 26 ms

L(AS-RC) ≈ 195 ms + 60 ms + 4 ms + 187.5 ms + 26 ms

L(AS-RC) ≈ 470 ms

A.36.3 Network Security

The following points are relevant in regard to data security within a network:

- The Route Control server is loaded from the Route Control Engineering Tool through a shared directory on the server or both servers (\\<computer name>\RC_LOAD)
- Route Control clients are loaded from SIMATIC Manager (RC application / Route Control object / Download to CPU) via a shared directory on the client (\\<computer name>\RC_LOAD)
- The communication between the RC Center and the Route Control servers is performed through TCP/IP sockets and the ports 0x3FFB (decimal 16379), 0x3FFD (decimal 16381).

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Glossary

AS-AS connection	Communication link between two automation systems; also referred to as cross-coupling in some cases. A (logical) AS-AS connection is always a point-to-point connection and is created for Route Control by the Route Control Wizard. A maximum of 32 automation systems are possible, so up to 32 * 31 connections are generated, that is, up to 31 connections per Route Control automation system.
AS-OS connection	Communication link between an automation system and a computer (the Route Control server in this case). A (logical) AS-OS connection is always a point-to-point connection and is created for Route Control by the Route Control Wizard. In the case of a standalone server for Route Control, there is one connection to the server from each Route Control automation system, thus, up to 32 connections. In the case of a redundant server system for Route Control, there is one connection from each Route Control automation system to each server, thus up to 2 * 32 connections.
Control element	See Abbreviations, CE
Cross-coupling	Cross-coupling always refers to a communication link between a Route Control automation system and another Route Control automation system.
Element subtype	Subtypes of a main type include items such as a motor or a valve in the group of control elements. Element subtypes are also differentiated with respect to activation commands and feedback. The subtypes can be found in Block Changes.
Element type	Route Control differentiates four main types of elements: - Control elements (CE) - Sensor elements (SE) - Linking elements (LE) - Parameter elements (PE) Control, sensor, and parameter elements are further divided into *element subtypes*.

Fault tolerance time	Once a mode level has been activated successfully (that is, all elements provide the expected feedback), the so-called fault-tolerance time begins. If an element briefly leaves its position, that is, the actual feedback differs from the expected feedback for a period less than the fault tolerance time, the route is not faulty. If, however, the time discrepancy exceeds than the fault tolerance time, the route is faulty.
Function ID	All material transports operate with a different value for the function ID parameter. Partial routes and elements are assigned a function ID by the route network when a search is made for a suitable path. This designation specifies whether a partial route or an element is locked for additional searches. Thus, both material transports, or short routes, cannot use the same element or the same partial route, which ensures that products are not commingled. In certain cases, however, product commingling is desirable, while in other cases, material from two sources is transported to one destination. In these cases, the same function ID must be entered for both routes (FUNC_ID parameter in the RC_IF_ROUTE); permission is thereby explicitly granted for both routes to operate together.
H-CPU	A CPU of an H-machine
H-machine	An H-machine consists of two CPUs, two PSs (power supplies) and 2 CPs (communication processors). The two CPUs are connected and represent a redundant AS pair. One CPU assumes control (master) and the other CPU remains ready as a reserve to take control if necessary (fault-tolerant system).
Linking element	See Abbreviations , LE
Location	Also a location. Locations designate the beginning and end of routes and partial routes. They can also be transition points, or so-called VIA locations for routes. There are two groups of locations: 1. Plant-related locations 2. Plant-neutral locations Plant-related locations are embedded in a plant hierarchy and are assigned to a process cell/unit. Plant-neutral locations are not embedded in the plant hierarchy and represent the various "unassigned" locations of the plant, such as a storm drain, manual fill operations, etc. For plant-related locations, the plant hierarchy must first be transferred from the S7 project to the Route Control project before the locations can be configured.
Location	See *Location*

Master AS	The master automation system (AS) is the automation system that controls the route and its elements. That is, it is the automation system in which the user program activates an RC_IF_ROUTE block and from which a route request is sent to the Route Control server. Therefore, every route requires exactly one master AS. See also *Slave automation system*
Mode level	The elements of a route or partial route do not all have to be activated or deactivated together. Instead, they can be inserted in up to 32 groups called mode levels. See also *Mode table*. The user program is responsible for linking the individual mode levels in a suitable way. For example: If "initial state reached," then "open transport valves" If "transport valves opened," then "switch on pump," etc. "Initial setting reached" signifies that the QMODE output parameter value of RC_IF_ROUTE that is linked to the mode level bit by an OR operation must produce a value of 1. "Open transport valves" signifies that the mode level bit for the MODE input parameter in RC_IF_ROUTE must be set to 1.
Mode table	A mode table includes up to 32 modes, or mode levels, and groups them into process-related levels. Examples include: Brewery (mode table) - Initial state (mode level) - Open transport valves (mode level) - Switch on pump (mode level) - Open source valve (mode level)
Parameter element	See Abbreviations , PE
Partial route	Partial routes form the individual segments of a route, for example, between the locations and branches. All partial routes combined form the route network from which the search algorithm selects certain partial routes and combines them into routes. Route elements are assigned to a partial route during project engineering.
Route	A route is the sum of all of its partial routes and is determined during runtime. A route includes all transport media and elements involved in its partial routes and extends from the source to the destination of the material transport. A route always consists of 1 to n partial routes. During Route Control project engineering, routes are not configured; rather, only partial routes are configured. A route is first created during runtime when a "route" is requested from the source to the destination of the material transport.

S7 connection	Logical communication link between: - One Route Control server and one Route Control automation system - Route Control automation system and another Route Control automation system; see *Cross-coupling*
Sensor element	See Abbreviations , SE
Server	Refers to the Route Control server Separate computer or a (redundant) pair of computers for processing route requests from the Route Control automation systems and which serves as an intermediate element between the Route Control automation systems and the clients (Route Control Center).
Slave AS	Slave automation systems (0 to 31) can also be involved in a route. These peer automation systems are controlled from the master automation system by means of cross-coupling and provide feedback to the master automation system. Each automation system can be a master with respect to one route and a slave with respect to one or more other routes. Like the master automation system, slave automation systems also receive their element list from the Route Control server. However, slave automation system do not request any routes. See also *Master AS*
Switch-off delay	See *Switch-on delay*
Switch-on delay	When a mode level is activated, elements such as motors and valves are normally activated immediately. In the field, however, activation of elements should sometimes be staggered. For this reason, a switch-on or switch-off delay can be configured on an element to run as soon as a mode level is activated or deactivated. The time delay can range from 0 to 255 seconds.
Switch-on tolerance time	When a mode level is activated, a watchdog timer is started. The expected feedback from all elements of this mode level must be available within this time. If even one of these elements does not provide the expected feedback, the switch-on tolerance time expires and route goes to error status (mode level error or mode error).

B Abbreviations

B.1 General

B.1.1 S88 Terms

ENTERPRISE	Company
SITE	(Production) location
AREA	Area within a site
PCELL	Process cell (plant)
UNIT	Portion of a plant
EMOD	Equipment module
UNIT LOCATION	Location in a unit, such as an inlet valve or a discharge valve

B.1.2 Abbreviations

Abbreviation	Meaning
ACE	Application Communication Environment Software component on a computer serving as a common communication layer between different applications. ACE is installed as a component as part of the setup program for Route Control. It is required for issuing Route Control server messages to WinCC and for redundancy interfacing.
AS	Automation system
BSEND	Communication service for transferring data blocks (as opposed to individual variables) Route Control uses the BSEND / BRCV mechanism for AS-OS communication.
CE	A control element is an object that can be activated and it can also supply a return value. Examples include motors, valves, pumps, controllable flaps, etc.
CFC	Continuous Flow Chart Element blocks and route blocks are inserted in CFCs and interconnected to blocks of other libraries or user blocks.
CFR	Code for Federal Regulations Used here in the context of FDA 21 CFR Part 11
CSV	Comma Separated Values ASCII text file in which values are separated by commas or other characters. This file format can be read into MS Excel, for example. Route Control offers an export and import interface in CSV format for partial routes and elements.
DB	Data block
EDC	Event-driven communication Communication layer between AS and OS in PCS 7 V5 or Route Control V5 EDC is no longer available in PCS 7 V6 and will therefore no longer be used by Route Control.
EKB	File extension for license files
EQM	Equipment In this case, EQM is the extension for a SIMATIC BATCH file that contains plant data (process cell, unit, etc.). This file is created by BATCH using the plant hierarchy in the S7 project and serves as the basis (physical model) for configuring recipes.
EPH	Equipment Phase An example is a phase module (CFC) that can be used to control a material transport (route).

ERP	Enterprise Resource Planning
	Planning level
ES	Engineering Station, Engineering System
FDA	Food and Drug Administration
	U.S. regulatory agency
FP	Faceplate
	In Route Control, a faceplate is a control dialog for a route. This control dialog is interconnected to a route (RC_IF_ROUTE) and can be opened from the block icon in a WinCC picture.
FUNC_ID	Function ID
F-system	Fail-safe system
H-system	Fault-tolerant system
IF	Interface
LE	A linking element is an object that represents a material in a transport medium, such as a pipeline or a conveyor belt. When a route is requested, the LE is also the means of performing the material compatibility check.
LIB	Library
LOC	Location (location in route network)
MAC	Medium access control
	In the case, medium access control is the interface address on Layer 2 of the ISO/OSI communication model. The MAC address is used to identify communication peers, for example, the AS-MAC address or OS-MAC address (of network cards).
MDAC	Microsoft® data access components
MDB	File extension for a Microsoft Access database
MES	Manufacturing execution system
	Architectural layer between the ERP and process control level
MLFB	Machine-readable product designation
	The MLFB is the order number for a product; it is intended to serve as both the type and system designations.
MP	Multiproject
MSXML	Microsoft XML
MT	Mode table
OB	Operation Block
OE	Object engine
	Runtime container for Route Control, BATCH, and WinCC in PCS 7 V5. The object engine is not included in V6.

OES	Order entry system
	System for planning batch orders and specifying and evaluating process parameters in PCS 7 V5.
OS	Operating station, Operating system
PCELL	Process cell, plant
PCS 7	Process control system of SIEMENS AG
PE	Parameter element. A PE is an object that specifies a setpoint and displays an actual value (from the process).
	The so-called external parameter element represents an expansion to the general parameter element. With an external parameter element, the setpoint is not yet known at the time the project is planned; it is not transferred until runtime. For this reason, a "wildcard" is configured. That is, a particular parameter element is referenced by its index. During runtime, the actual setpoint is transferred as a parameter in the RC_IF_ROUTE block. The block then passes this value to an output where it can be adopted by the user program.
PLC	Programmable logic controller
	(automation system)
PR	Partial route. See also Glossary / Partial route
PT	Process technology
PTE	Process technology elements
	In this case, process technology elements are represented by a library with blocks for activating process elements such as motors, valves, etc.
	Comparable to the standard library of PCS 7.
QS	Quality assurance
RC	SIMATIC Route Control
	Product
RCC	Route Control Center
	User interface for routes with detailed display of route elements and their status
RC_IF	All Route Control interface blocks begin with this name element, IF = Interface
RCE	Route control element
	A control element interconnected in a partial route
RLE	Route linking element
	A linking element interconnected in a partial route
RPE	Route parameter element
	A parameter element interconnected in a partial route
RSE	Route sensor element
	A sensor element interconnected in a partial route

RCS	Route Control system
	RCS was the product abbreviation up to Version 5; starting with Version 6, the product abbreviation is RC
SB	SIMATIC BATCH
SC	SC block library
	Comparable to the standard library of PCS 7 or the PTE library
SE	Sensor element. A sensor element is an object that returns a value from the process and specifies whether an expected actual value is equivalent to the current actual value. Sensor elements are not activated. Examples include conductivity measurements, flow rate measurement sensors, and limit switches.
SFC	Sequential function chart
	Route Control V6 offers a typical SFC that can be further developed for use in creating your own SFC block.
SIS	SIEMENS interception system
	Communication interface; for example, SIMATIC BATCH offers SIS for interfacing an MES.
SL	SIMATIC Logon
	Software component of SIEMENS for checking access control/user authorization used by WinCC, BATCH, Route Control, and other products for authentication.
TCP/IP	Transport Control Protocol / Internet Protocol
	Level 3 or Level 4 data communication protocol of the ISO/OSI communication model
TH	Plant hierarchy
	Plant hierarchy-related names can be assigned to locations in Route Control. The plant hierarchy can also be transferred from an S7 project to the Route Control project using the wizard.
TQM	Partial EQM, see EQM
	When the project engineering is distributed, the data of an EQM file are stored in a so-called TQM files.
TSAP	Transport Service Access Point
	Access point of a communication level of the ISO/OSI model
UC	Use case
	Typical use case

UDA	User-defined attribute Route Control uses three UDAs; they enable the Route Control Wizard to recognize which element type is concerned: RC_TYPE: Element type, such as CE, SE, PE, LE RC_SUBTYPE: Element subtype, such as, MOTOR, VALVE, etc. RC_ID_PARAM: Name of input containing the ID for example, ID or, for remote elements, LOC_ID
UDT	User-defined data type User-definable data type for programming in the S7 project
WinCC	Windows Control Center
XC	Cross-coupling In this case, cross-coupling refers to the lateral communication links between the automation systems of Route Control
XML	Extended markup language Structured language for describing data
XSLT	Extended style sheet template File containing the layout for display of data from an XML file